Illustrated Catalogue N°174

A. & J. MAIN & Co LIMITED

MANUFACTURERS of IRON ROOFING & BUILDINGS of EVERY DESCRIPTION for HOME or FOREIGN REQUIREMENTS

LIGHT STEEL AND IRON BRIDGES

STRUCTURAL ENGINEERS

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IMPORTANT.

In submitting a **REVISED EDITION** of our Catalogue of Steel and Iron Structures, we would respectfully direct the attention of intending purchasers to the following brief, but important notes :—

THE DESIGN.—Economy being of the greatest importance, the actual requirements only should be stated, leaving the manufacturers free to choose the most suitable and economical design; but should special circumstances demand special treatment, full particulars (accompanied, if possible, by a sketch) should be supplied.

THE SCANTLINGS OR STRENGTH OF THE SEVERAL PARTS.—These should always be left to the manufacturer to determine, care being taken to clearly state if any extra strains have to be provided against, such as exceptional weight on floors (*stating this weight*); columns required to carry shafting (*stating diameter, speed, and machines to be driven from same*); and other similar information.

COMPARING COMPETING DESIGNS AND SCANTLINGS.—Structures which are *too light* for their purpose are dangerous, if not useless, and to be utterly condemned. It is absolutely essential for the safety of the structure that every bar and bolt be sufficiently strong to safely resist the *maximum stress* which can come upon it, *but anything beyond this is not required*, and may even prove *injurious* by adding unnecessarily to the weight of the structure, and certainly adds to the cost of carriage.

Greater total weight of framing is no proof of greater actual strength, and consequently greater value, as it is obvious that *one weak part* in the structure, like one defective link in the chain, cannot be compensated for by any excess of strength, however great, in the rest of the framing. Every part must be of *proportionate and sufficient, but not excessive, strength;* and this can only be ensured where the manufacturer conscientiously tests, both by calculation and stress diagrams where necessary, each individual design he may prepare.

The total weights of sheets should always be compared.—Thus, two manufacturers may each specify No. 22 gauge galvanized sheets, the one meaning sheets which gauge this *after galvanizing*, being in that case actually only about No. 24 when black; while the other means No. 22 gauge *black* sheets, *which measure after galvanizing about No. 20;* the latter being, of course, the stronger and more expensive article.

FIRST-CLASS DESIGNING, MATERIALS, WORKMANSHIP, AND CAREFUL FITTING MAY, OF COURSE, MEAN SLIGHTLY INCREASED FIRST COST; BUT IN ALL CASES, ESPECIALLY FOR FOREIGN REQUIREMENTS, THIS EXTRA EXPENSE IS MORE THAN BALANCED BY SAVING IN TIME, WORRY, AND MONEY WHICH FOLLOW IN CARRIAGE AND ERECTION.

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Some of the Tea Gardens in India and Ceylon to which we have supplied Factories, Bungalows, &c., within recent years.

INDIA

(ASSAM, CACHAR, DARJEELING, DOOARS, AND SYLHET).

Addabari
Aenakhall
Aibheel
Allynugger
Amluckie
Amo
Amrail
Appin
Atal
Atkhel
Attah Barrie
Badamtam
Badulipur
Bagracote
Baintbaree
Baitakall
Bajaltollee
Balijan
Balisera
Ballacherra
Bamgaon
Bamonpookree
Baradighi
Bargang
Barnesbeg
Barous
Beheating
Behora
Behubor
Belgachi
Bhagicherra
Bhogotpore
Bhuberighat
Bicrampore
Bindukuri
Birpara
Bishnauth
Blackburn
Bokel
Boraki
Borborooah
Borghat
Borjan
Borjulie
Boro Jalingah
Budla Beta
Bullabarrie
Bundoo Dewan
Burjan
Carron
Chalouni
Chandkhira
Chandpore
Chargola
Chatlapore
Chenga
Chengmari
Cherideo
Choonabhattie
Chota Jalingah
Chowkeedinghee
Chuapara
Chulsa
Chundeecherra
Cinnatolliah
Craigpark
Dalgaon
Dam Dim
Dapoota
Daragaon
Deanston
Debroo
Deckajulie
Degaicherra
Dehingeapar
Dejoo
Deohall
Deopani
Derby
Deroi
Desang
Dewan
Dhendai
Dhulapadong
Dikom
Dilkush
Dinjan
Diploonga
Dolaguri
Doloi
Doloo
Doolahat
Doollabcherra
Doom Dooma
Doomur Dullung
Ellenbarrie
Ethelwold
Fenowa
Gabroo Purbut
Gairkhatta
Gandrapara
Gatoonga
Gelahatting
Gelakey
Ghatia
Ging
Good Hope
Goombira
Grassmore
Greenwood
Hahaipatha
Hantapara
Harchurah
Hasmara
Hatticherra
Hattikhira
Hattikuli
Hattigor
Hautley
Heeleaka
Hilika
Hingajea
Holicherra
Hoolmaree
Hope
Huldibarie
Huntapara
Indanugger
Indong
Jafflong
Jagcherra
Jainti
Jaipur
Jalinga
Jameerah
Jellalpore
Jhoori Valley
Jiajuri
Jiti
Kalacherra
Kalagoitee
Kalchenee
Kalighat
Kaliti
Kalline
Kallinecherra
Kannyhatti
Kettela
Keyhung
Khadim
Khobong
Khongea
Kisna
Koleapane
Kolony
Koomlai
Koomtai
Kumai
Kurmah
Kuttal
Labac
Lallacherra
Lallakhal
Lallamookh
Lankapara
Lattakoojan
Lebong
Letekoojan
Longai
Longsoal
Loobahcherra
Lungla
Luskerpur
Mackeypore
Madabpore
Madoora
Mahmara
Majagram
Majulighur
Malneecherra
Manabarrie
Marionbaree
Massempore
Matelli
Meenglas
Merbhil
Mertinga
Messamara
Mijika
Moabund
Modopee
Moheema
Mohokotee
Monabarrie
Monee
Mookham

Some of the Tea Gardens in India and Ceylon to which we have supplied Factories, Bungalows, &c., within recent years.

INDIA

(ASSAM, CACHAR, DARJEELING, DOOARS, AND SYLHET)—*Continued.*

Moortee	New Glencoe	Pathini	Rajghat	Samaguri	Singla	Taipoo
Moran	Newlands	Patrakola	Rajmai	Samanbagh	Singlacherra	Tara
Morapore	Nya Sylee	Pertabgarh	Rajnagar	Sangsua	Socklatinga	Tarajoolie
Mothola	Okayti	Phulbarie	Rasetpur	Scottpore	Sonajuli	Telepara
Mugracherra	Ord Terai	Phulcherra	Rema	Seconee	Sonarupa	Thurbo
Nagaisuree	Pabbojan	Pollorbund	Rosekandy	Selim Hill	Soongachi	Tingri
Nahartoli	Pabhoi	Poloi	Rungaghur	Sessa	Subong	Tiphook
Namgaon	Pahar Goomiah	Powai	Rungamattee	Shakomato	Suntok	Towkok
Nazira	Paneery	Rajabarrie	Rungamutty	Shumshernugger	Surma	Travancore
Nedeem	Panitola	Rajabhetta	Sagmootea	Silcuri	Sylee	Washabarrie
Negheriting						

CEYLON.

Agrakande	Burnside	Galaha	Ingoya	Mariawatte	Nahalma	Torwood
Alton	Dewalakande	Glendon	Kanangama	Matakele	Sunnycroft	Wallaha
Atgalla	Diyagama	Haputale	Kelani	Mundama	Tangakillie	Yataderia
Blackwater						

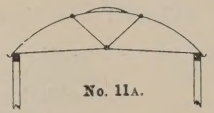
CURVED SECTIONS.

"SELF-SUPPORTING" IRON ROOFS.

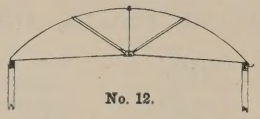
In this class of Roofing no complete trusses (or principals) are used, the sheets alone, with light bracing as may be required, being sufficient. The roof must be semi-circular or curved in form; and as the strength of the structure mainly lies in the sheets, and in the proper fixing of these at the eaves and to the bracing, special precautions require to be taken in determining the strength and arrangement of these parts.

We do not recommend this style of roofing for spans above 30 feet wide.

No. 10.



No. 11A.



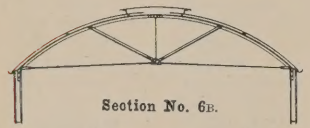
No. 12.

Sec. No. 10 is suitable for spans up to about 20 ft.
,, 11A ,, ,, from 20 to 24 ft.
,, 12 ,, ,, from 24 to 30 ft.

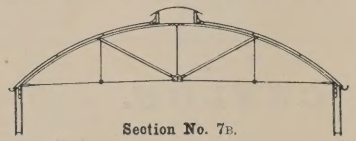
"TRUSSED" IRON ROOFS.

In this class, **trusses** or **principals,** and purlin-bars, are arranged so as to form a complete frame, on which the sheets are secured. As it is this framework which gives the strength to the structure, the thickness (or gauge) of the sheets is mainly determined by the durability required.

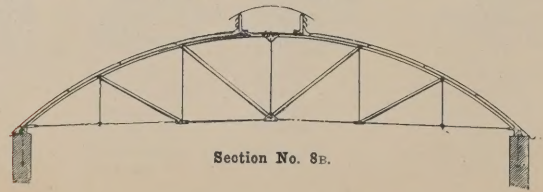
Three Sections of **Curved Trussed Roofs** are given below:—



Section No. 6B.



Section No. 7B.



Section No. 8B.

Section No. 6B will suit for spans from about 28 to 32 feet.

Section No. 7B will suit for spans from about 32 to 42 feet.

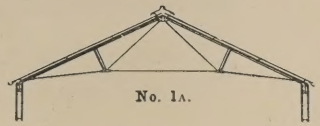
Section No. 8B will suit for spans of about 42 feet and upwards.

RIDGED SECTIONS.

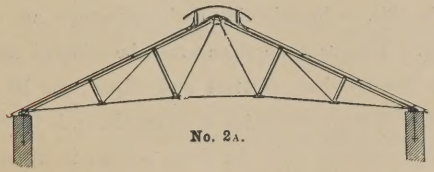
"TRUSSED IRON ROOFS."

Below are given four Sections of Ridged Trussed Roofs, the prices of which, with the Sheets, are slightly dearer than the Curved Roofs, but, in many cases, are more suitable :—

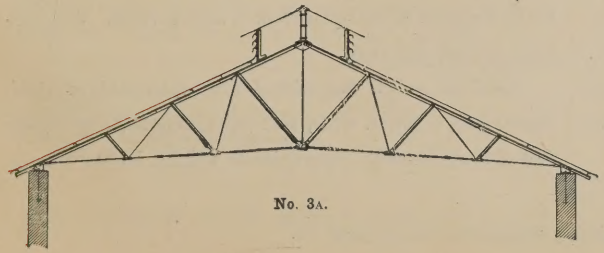
No. 0.



No. 1A.



No. 2A.



No. 3A.

Section No. 0 will suit for spans up to about 22 feet.
,, 1A ,, ,, from about 22 to 32 ft.
,, 2A ,, ,, ,, 32 to 45 ft.
,, 3A ,, ,, of about 45 ft. & upwards.

VENTILATORS.

In many cases Ventilators are required in the Roof, and in the preceding Sections a few forms of these are sketched. Either of these types is applicable to any of the Trussed Sections, whether Curved or Ridged Roofs.

In **"self-supporting"** Roofs, however, as the strength of the Roof Sheets must not be interfered with, the only simple form of Ventilator we recommend is that shewn on Section No. 11A.

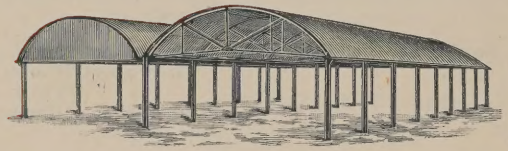
We shall also be pleased to quote for any special type on receipt of full particulars of same.

ROOF-LIGHTS.

Wherever possible, all lighting should be got from the sides or ends of the building, as Roof-lights, besides being somewhat costly, are apt to give trouble through their liability to get broken, or to leak during wet and stormy weather.

Where they must be introduced, however, we shall be pleased to submit what we consider the most suitable arrangement, or will quote to any design submitted to us.

OPEN STORES OR SHEDDING.

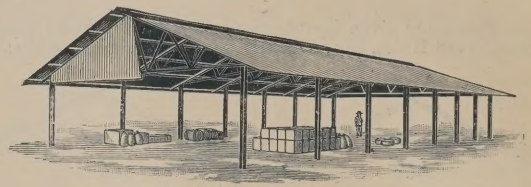


No. 2020.

In the Store above illustrated the Columns used are, as in most of our Buildings, of Rolled Steel, being in consequence much lighter and less liable to breakage than Cast-iron.

Wrought-iron Gutters and Pipes for both Eaves and Valley are shewn in this design, and where Roof is intended for abroad these are made of extra large capacity.

Approximate price for Double-span Open Store, 150 ft. long × 84 ft. wide, packed for shipment and delivered f.o.b. Glasgow, 10d. (approximately) per square foot of area covered. Approximate weight, 534 cwts.



No. 2030.

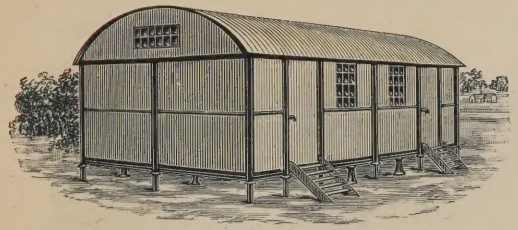
In this, as in adjoining design, Columns are of Rolled Steel. Two or more Spans may be adopted as desired, and Wrought-iron Gutters and Pipes can be supplied instead of large projection at Eaves shewn in illustration.

Approximate price for Store similar to above, 200 ft. long × 56 ft. wide, packed for shipment and delivered f.o.b. Glasgow, 1/ per square foot of area covered. Approximate weight, 920 cwts.

Store, as above, but with Double-span Ridged Roof 185 ft. long × 100 ft. wide, 10d. (approximately) per square foot of area covered. Approximate weight, 1,150 cwts.

For directions for transmitting measurements, see page 66.

IRON GRANARIES.



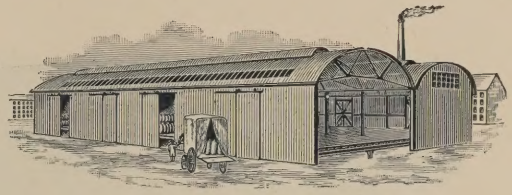
No. 2000.

The above design illustrates a form of Granary largely used, both at home and abroad, for storing grain either in bags or bulk.

The Floor is usually raised about 2 feet above ground, the Columns and Intermediate Supports being fitted with Vermin-proof Caps.

Approximate price of Granary as above, 35 to 50 feet long, by 15 feet wide, Floor of purchaser's wood, 2/2 to 2/4 (according to size) per square foot of area covered.

If Floor be formed of G. C. Curved Sheets, the price will be increased by about 1/2 per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow. Doors and Windows extra.



No. 2010.

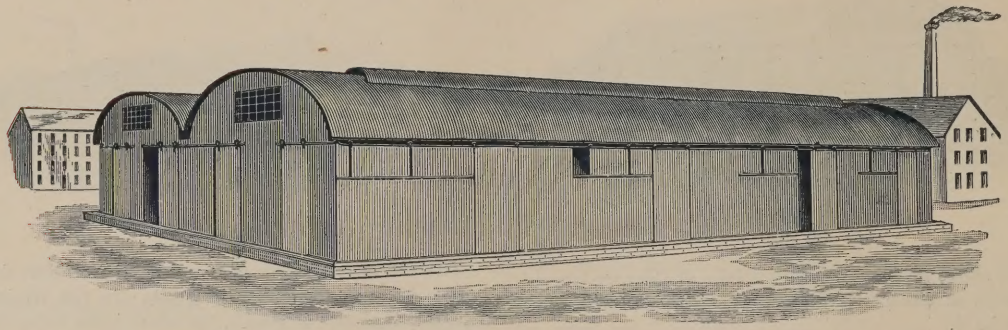
The above is a form of Granary constructed for the storage of large quantities of grain. In the illustration the Floor is shewn of timber, the wood joists being carried on Iron Cross Beams, supported in centre by short Iron Columns. If desired, however, a **Fireproof** Floor can be supplied, as either "A," "B," or "C," Design No. 2230, page 53.

Approximate price for Double-span Granary, as above, 250 feet long, by 60 feet wide, 2/ per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow.

If with **Fireproof** Flooring, as in "B," Design No. 2230, page 53, about 2/6 per square foot of area covered. Iron Windows, if desired, extra.

When writing for definite prices, it is advisable to state, in addition to dimensions, what quantity of grain the building is required to contain, and whether in bags or bulk.

ENCLOSED STORES OR GO-DOWNS.



No. 2040.

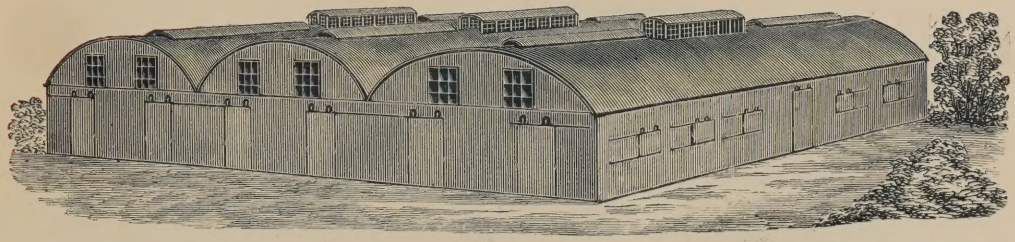
The above illustrates an Enclosed Store or Go-down, constructed **entirely of Wrought-iron.** The particular Building here shewn (as well as many others almost identical) was constructed by us for a Jute Go-down. Iron Sliding Doors and Shutters, complete with fastenings, were supplied as shewn.

Approximate price for Double-span Store, as above, 200 feet long × 80 feet wide, 1/1 per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow. Approximate weight, 1,150 cwts.

Similar Store, 100 feet long × 30 feet wide (Single-span), with two Sliding Doors, including Ventilator, Windows, or Shutters, 1/4 per square foot of area covered. Approximate weight, 360 cwts.

For directions for transmitting measurements, see page 66.

ENCLOSED STORES OR GO-DOWNS—*Continued.*

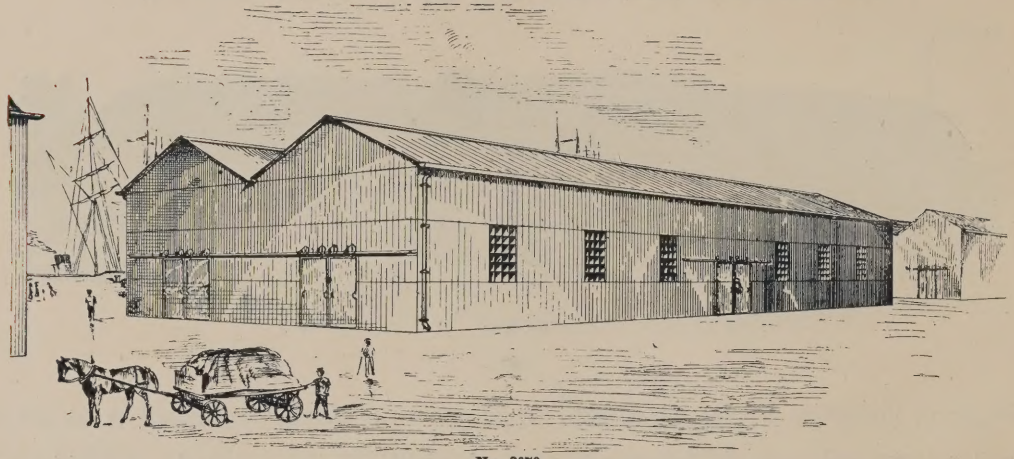


No. 2050.

The above illustration is also taken from one of several Buildings constructed by us for Jute Go-downs or Stores, and, as in the former case, was made entirely of iron and steel. In addition to the ordinary ventilation given with such Buildings, the above was fitted with a special combined Ventilator and Skylight in the centre of each Roof, as shewn.

Approximate price for Store as above, consisting of three Spans, each 40 feet wide × 132 feet long, and 13 feet high to Eaves, with Doors, Sliding Shutters, Windows, and Ventilators, all as shewn, 1/4 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 1,350 cwts.

ENCLOSED STORES OR GO-DOWNS—*Continued.*



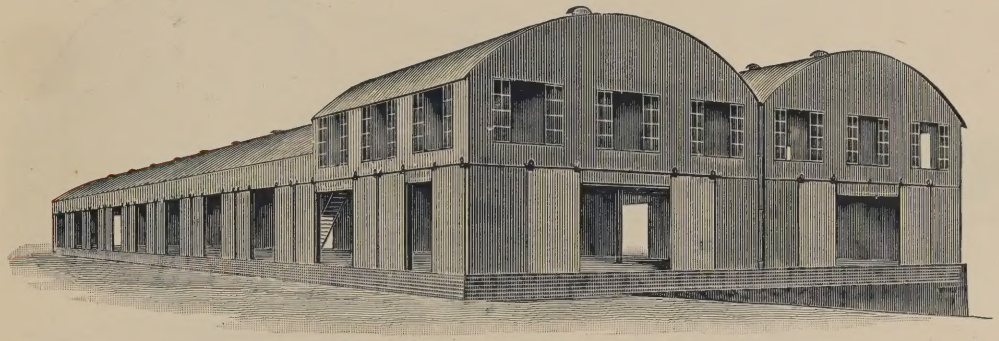
No. 2070.

This design shews another form of Building, suitable for ordinary Dock Warehouses, &c., having Double-span Ridged Roof on Iron or Steel Columns, sheeted all round, and supplied with Iron Doors and Windows, as previously described.

Approximate price for Building as above, 200 feet long × 66 feet wide (two 33 feet Spans), Roof Sheets Double-lapped, 1/5 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 960 cwts.

Somewhat similar ranges of Shedding have also been supplied and erected by us at the Swanson Dock, West Hartlepool, and for the River Wear Commissioners at Sunderland.

ENCLOSED STORES OR GO-DOWNS—*Continued.*



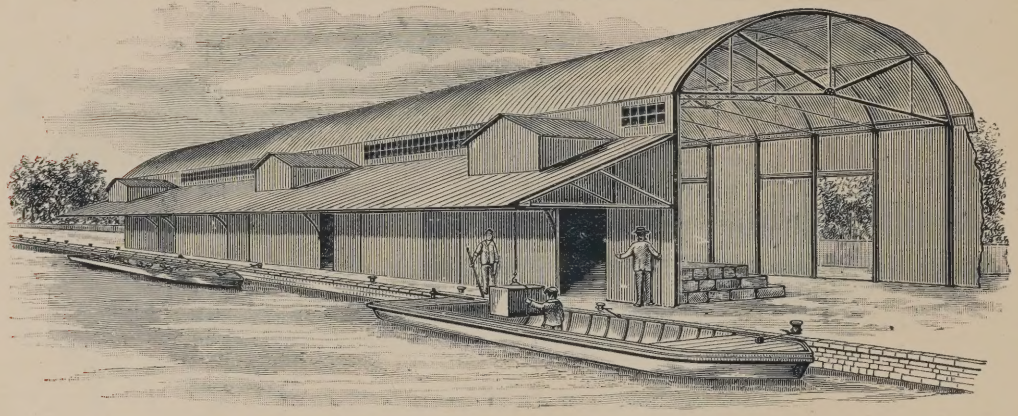
No. 2041.

The above Block is from a photograph of another all-iron Go-down erected by us in India, measuring 250 ft. long × 74 ft. wide, with light Travelling Crane running down one span, to facilitate the handling of goods.

The upper part of high portion at end is used as Offices for the Store Clerks, having ample light and ventilation.

As a guide to cost, it may be mentioned that the Building, complete with Doors, Windows, Ventilators, and Stairs, costs about 1/5 per square foot of area covered, packed and delivered f.o.b. Glasgow. The total weight ran out about 1,640 cwts.

WHARF SHEDDING.



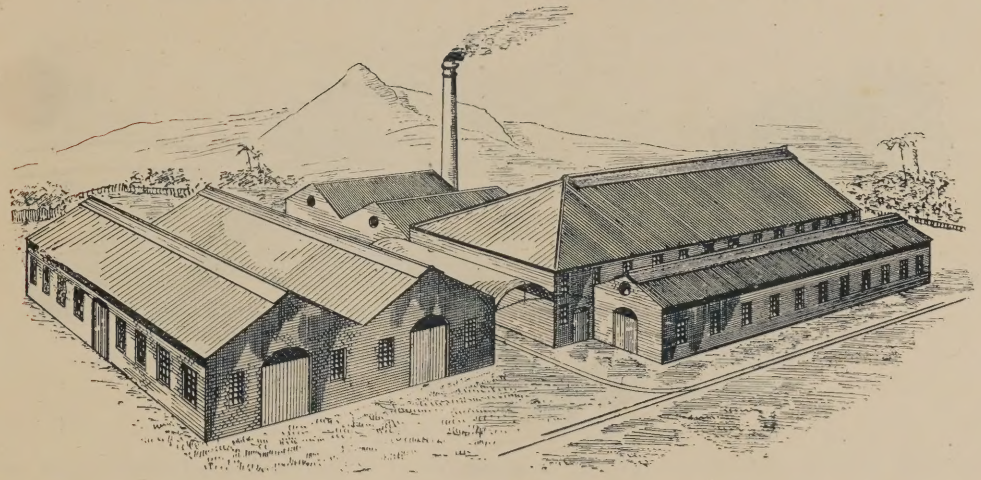
No. 2060.

This illustrates another form of Enclosed Store, which was specially designed for the bank of a canal or similar situations, having an overhanging Shelter to protect the Barges while being loaded and unloaded. The Store proper, with Curved Roof, is closed in to ground with Corrugated Sheets fixed on Iron Framing, Iron Doors and Windows being arranged as necessary.

The trussing of the Shelter is supported from the Columns of the Main Building by being constructed in the form of a large Bracket, thus leaving the front clear of supports, and, to give necessary headroom for working the Cranes, part of the Roof of Shelter is covered by raised Dormers, as shewn.

In writing for definite prices it is necessary to give, in addition to full dimensions, the number of Cranes required, with headroom necessary over them.

IRON FACTORY BUILDINGS.



No. 2190.

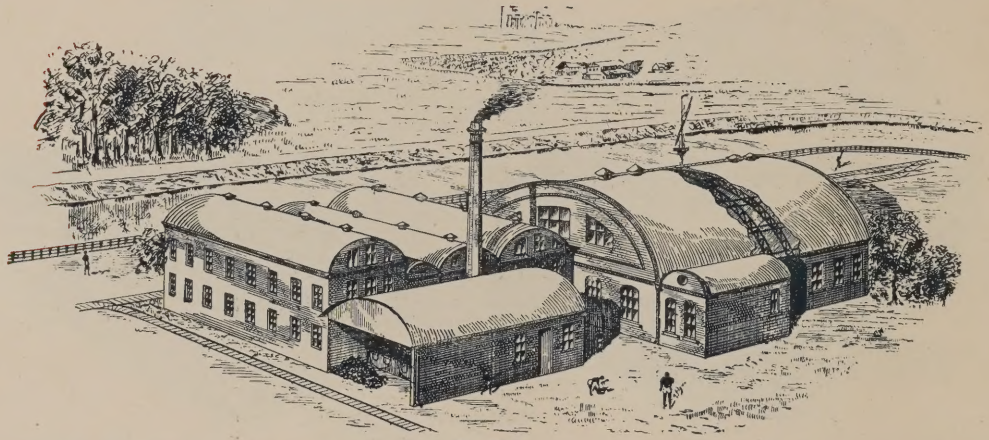
The above shews a very compact group of Buildings completed by us for a **Sugar Factory** abroad, and contains all the houses necessary for the various processes in connection with sugar manufacture.

The Roofs are of Galvanized Corrugated Iron, carried upon Steel Framing, supported by Steel Columns.

Light is given by means of Wrought-iron Glazed Windows at sides and ends.

Ridge Cap Ventilators were provided where necessary, and in some of the Buildings special provision for ventilation at the Eaves was also given.

IRON FACTORY BUILDINGS—*Continued.*



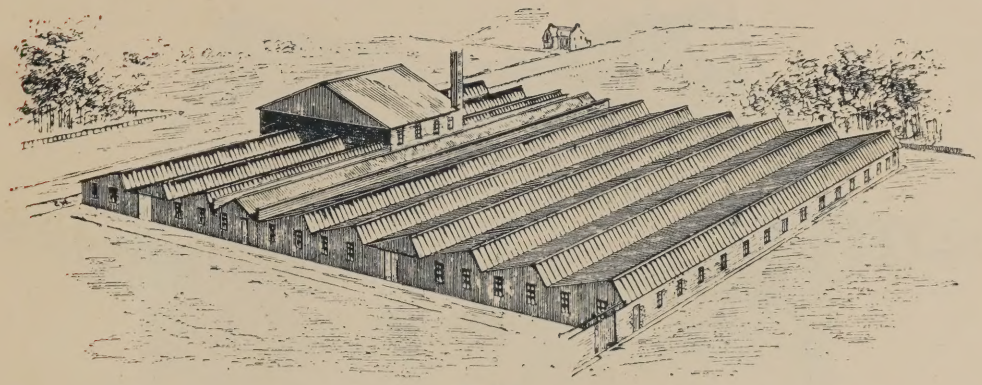
No. 2240.

This design is taken from a group of Buildings erected by us for the Bally Paper Mills Coy., Calcutta, comprising Engine and Boiler House, Beater and Breaker House, Machine House, &c., &c.

The Roofing was of the Double-shell type (as shewn partly in section), with Cowl Ventilators on crown, and the various Buildings were specially designed to meet the requirements necessary for the complete manufacture of all classes of paper.

As the arrangements of such Factories are more or less special, no approximate cost can be given, but designs and prices will be made up on receipt of full particulars.

IRON FACTORY BUILDINGS—*Continued.*

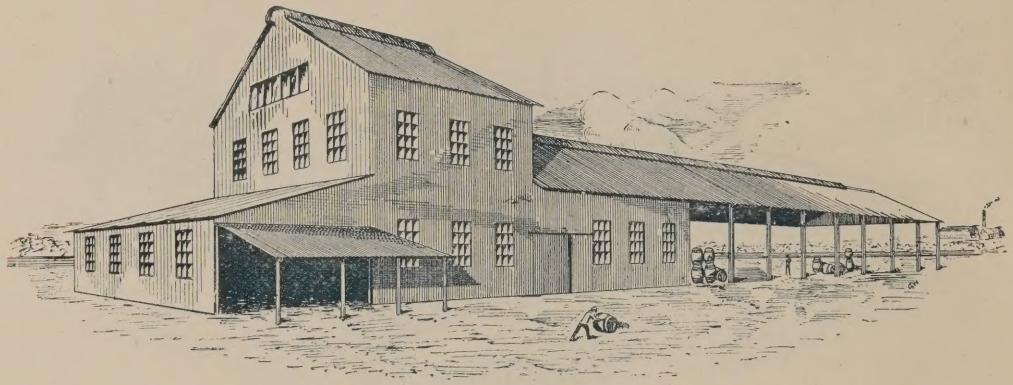


No. 2250.

The above illustrates a Manufactory for **Woollen or Cotton Fabrics**, with Iron Roof, constructed on the "Northern Light" principle, to give sufficient and suitable light for the requirements of such a Factory. The flatter slope of Roof is generally covered with Galvanized Corrugated Sheeting, but, if desired, it may be arranged to suit slates or tiles, in which case special mention should be made. A strong Galvanized Wrought-iron Gutter runs along each valley.

The Columns can be spaced to suit any arrangements of machinery, and, if necessary, may be made strong enough to carry shafting.

IRON DISTILLERY BUILDINGS.



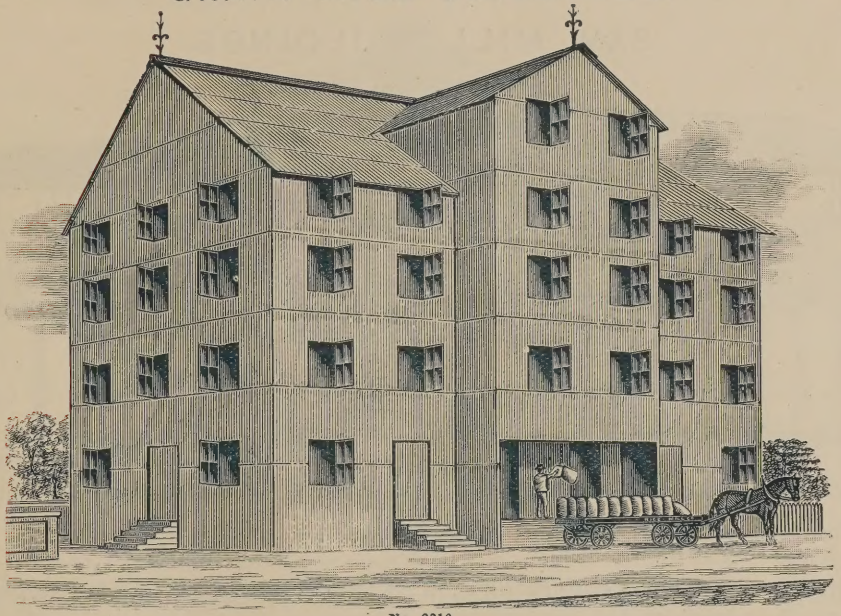
No. 2180

The above illustrates a group of Buildings supplied by us for a Distillery in South America, comprising—Still House, fitted with necessary iron platforms, &c.; Boiler House, with Coal Shed attached; also Cooperage and Loading Shed, all generally as shewn above.

The dimensions of the different Buildings are as follows:—Still House, 30 feet long × 40 feet wide × 40 feet high; Boiler House, 40 feet long × 30 feet wide; Coal Shed, 30 feet long × 10 feet wide; Cooperage and Loading Shed, 150 feet long × 40 feet wide × 24 feet high.

Designs and Prices on application.

GRAIN MILL BUILDINGS.

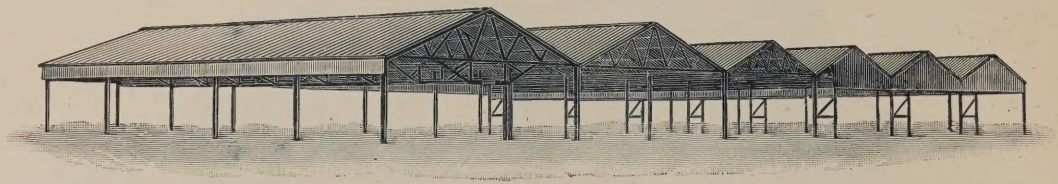


No. 2210.

We have supplied many Rice Mill Buildings, generally to this design with slight modifications. The above Building covers an area of 3590 square feet, and, with the exception of Floors, is entirely constructed of iron, including Doors and Shutters.

Approximate price, 6/6 per square foot of area covered, packed and delivered f.o.b. Glasgow, exclusive of Windows and Doors.

SAW MILL BUILDINGS.



No. 2191.

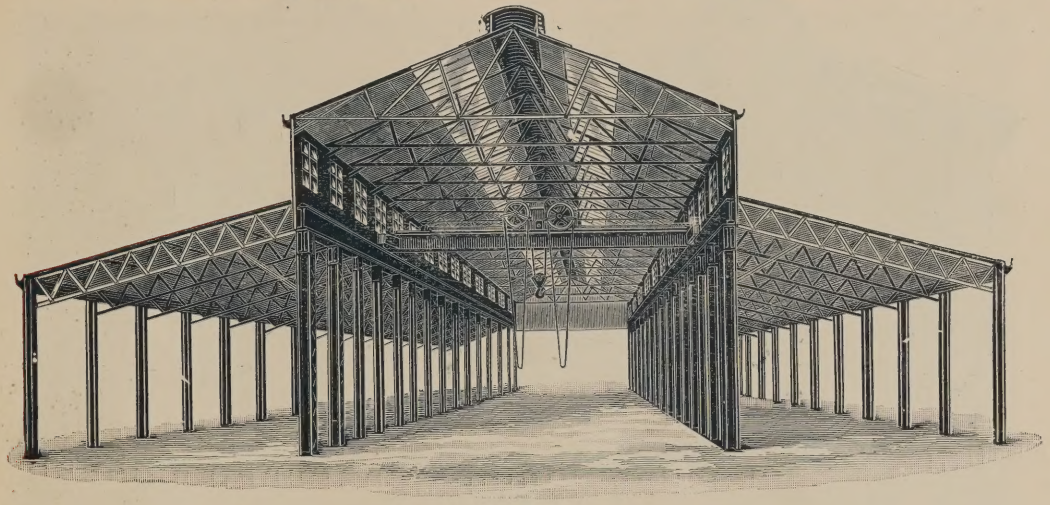
The above Block is taken from the drawings of a Saw Mill Building supplied by us for Burmah, consisting of six Spans, covering an area of 26,000 square feet.

In addition to the Building shewn, an Engine and Boiler House was also supplied, and preparation was made throughout for carrying Shafting, &c.

Special arrangements were also made (as shewn in the Span in foreground) for a Log Gantry, to facilitate the handling of heavy timber.

The approximate price of this Building works out to 1/9 per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow. Any modification of design would affect this price.

ENGINEERING SHOPS OR FACTORIES.



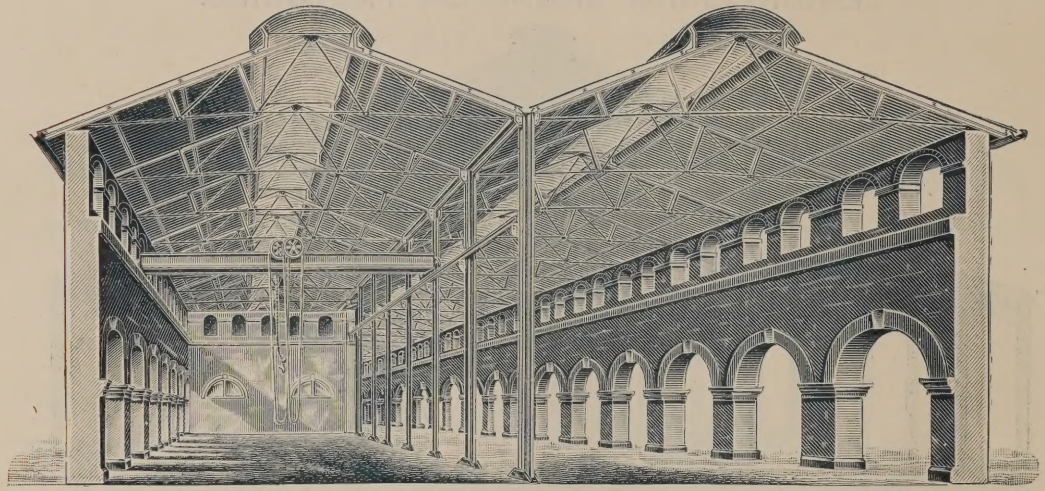
No. 2221.

The above design illustrates an Iron Building supplied by us for **Boiler Shop** abroad, the dimensions being—Main Building, 300 feet long × 50 feet wide × 37 feet 6 inches high to eaves, with Verandah at each side 30 feet wide, and 20 feet high to eaves, having Ridged Roof with large Ventilator and Skylights, supported on extra-strong Columns, which also carry a large Travelling Crane running full length of Building, and the necessary Shafting to drive the various machines.

In addition to information asked for on page 66, it is necessary, to enable us to design the Structure in the most efficient manner, that we should know diameter and speed of shafting, and particulars of machinery driven from same, also maximum load to be lifted by Crane, and weight of latter.

Approximate price for this Building was 2/4 per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow. Its approximate weight was 5,580 cwts.

FOUNDRY BUILDINGS OR WORKSHOPS.



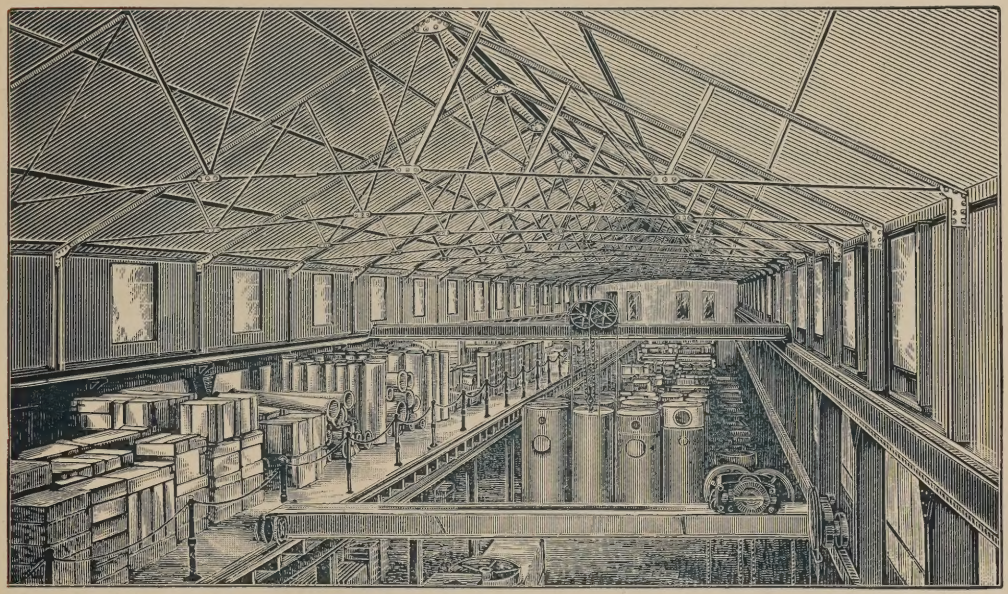
No. 2222.

The above illustration is from a photograph of the interior of a large Foundry—180 feet long × 80 feet wide × 31 feet high—supplied and erected by us in Calcutta.

In this instance the Roof is carried at outsides on brick walls, and in centre on strong H Steel Columns, these latter having Beams and Rails for Overhead Cranes running full length of one span. The Roof is covered with Galvanized Corrugated Sheets, and large-sized Ventilators, as shewn, run full length of each span.

Approximate price of Building, as above, packed and delivered f.o.b. Glasgow, 1/ per square foot of area covered. Weight, about 1,100 cwts.

ENGINEERING STORE OR GO-DOWN.

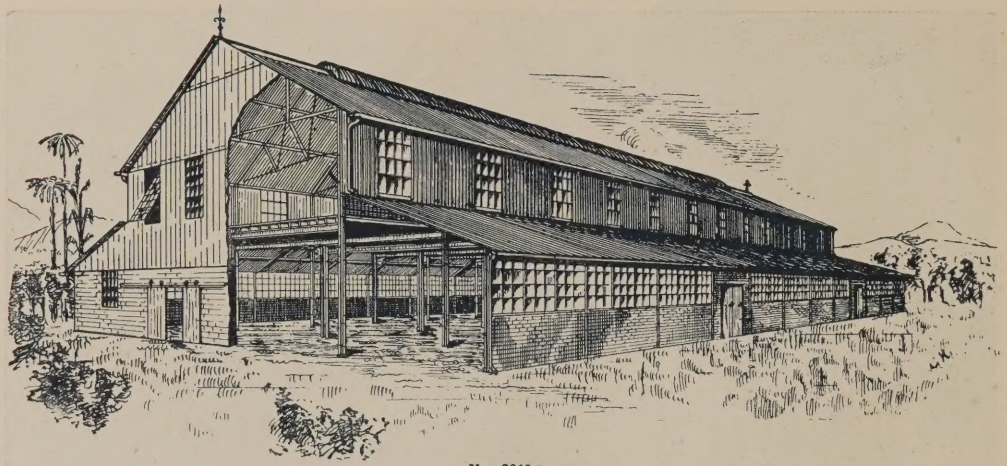


No. 2223.

This block is taken from a photograph of the interior of a Machinery Store supplied and erected by us abroad, which measures 250 feet long × 43 feet wide × 28 feet high; is entirely iron-framed, and sheeted on both Roof and Sides. It has two Overhead Travelling Cranes running the full length, one side of the smaller one being carried on Girders and Columns, which also support a narrow Upper Floor, as shewn.

Approximate price of this Building, packed and delivered f.o.b. Glasgow, 2/2 per square foot of area covered. Weight, about 2,550 cwts.

TEA FACTORIES.



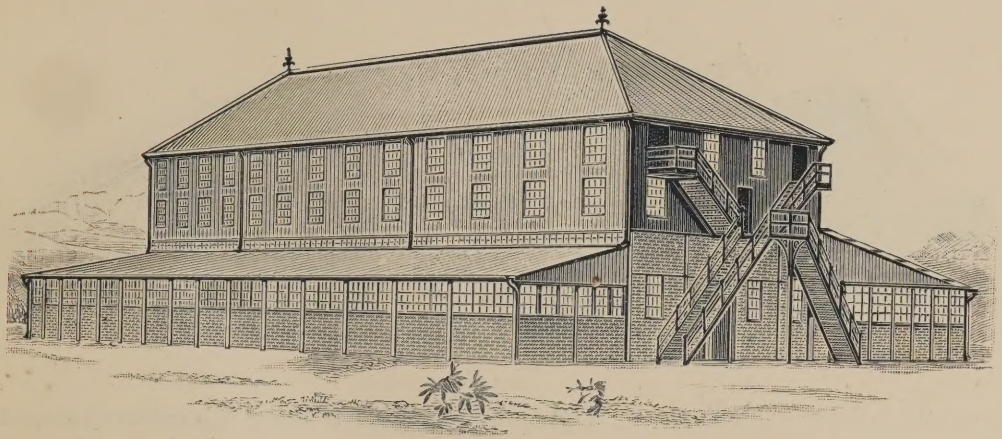
No. 2090.

We have for many years devoted special attention to the construction of Buildings for Tea Estates, and have supplied either Factories, Leaf Houses, Bungalows, Wood Sheds, or Coolie Lines, to most of the principal gardens in India and Ceylon. The designs here given of this class of work, as in fact almost all others in this Catalogue, are practically reproductions of buildings actually supplied by us.

Approximate price for Factory as above, 100 feet long × 40 feet wide × 22 feet high, Verandah each side 20 feet wide, Sheets double-lapped, 1/3 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate shipping weight, 900 cwts.

Erection of Iron Roofing and Buildings in India estimated for.

TEA FACTORIES—*Continued.*



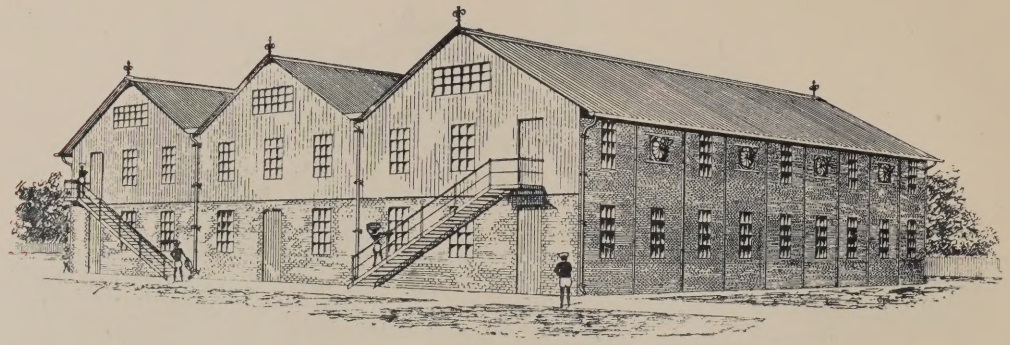
No. 2101.

This Factory is an improvement on that in the previous illustration, being considerably higher, and having two Withering Lofts instead of one, with wider Verandah on one side to contain Firing Machinery. An Iron Staircase is also shewn outside the building, which permits of the Leaf being taken direct into the Lofts without having first to pass through the manufacturing floor.

Approximate price for building as above, 143 feet long × 50 feet wide × 29 feet high, Verandah one side, and one end, 20 feet wide, other side 40 feet wide; 1/5 per square foot of area covered, packed and delivered f.o.b. Glasgow, including Doors and Windows. Approximate weight, 1,840 cwts.

Iron Staircase, for wood or iron treads, extra.

TEA FACTORIES—*Continued.*



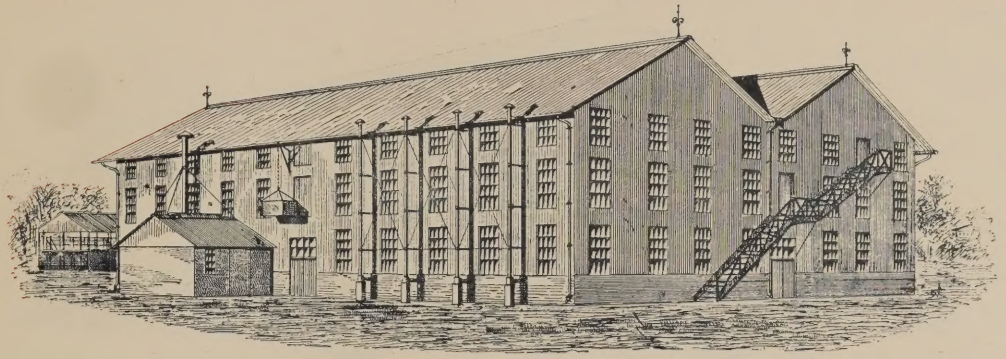
No. 2120.

Though the building in this illustration is larger than any of the foregoing, it is eminently adapted for a young garden, as, if necessary, only one Span (prepared at one or both sides for extension) can be erected the first year, and others added as required.

Factories of this class are generally supplied in Spans of about 40 feet wide by about 90 to 100 feet long, as, with a greater length, the building is apt to be too dark when three or four Spans have been added. It is advisable also to have as many Windows as possible in the ends of Spans, fixed close under the Loft floor, so as to throw the light well into the centre of the house.

Approximate price for Factory as above, 90 feet long × 120 feet wide (three 40-feet Spans) × 22 feet high to Eaves, one Loft, and Sheets double-lapped, 1/7 per square foot of area covered, packed for shipment and delivered f.o.b. Glasgow. Approximate shipping weight, 1,180 cwts. Staircase extra.

TEA FACTORIES—*Continued.*



No. 2130.

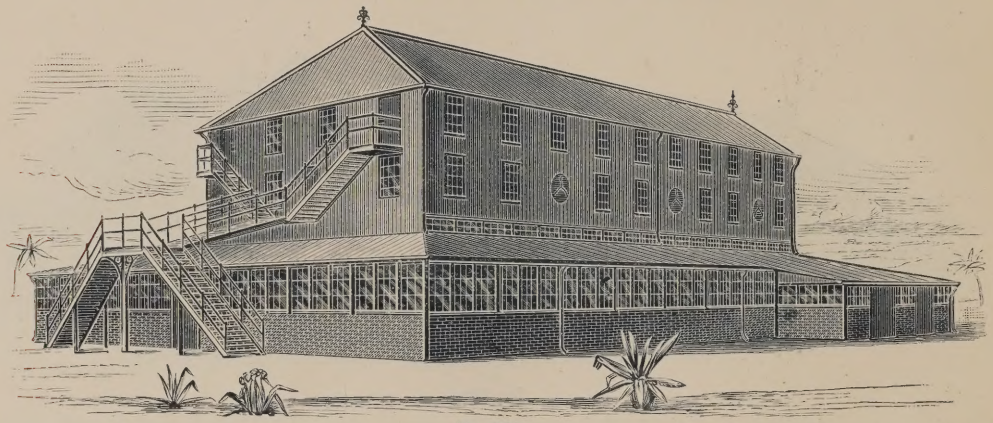
This illustrates a Factory similar to No. 2120, but in two Spans, and having two Withering Floors. An Engine-house is shewn adjoining Main Building.

Approximate price for Factory as above, 90 feet long × 80 feet wide (two 40-feet Spans) × 29 feet high to Eaves, two Lofts, Roof Sheets double-lapped, 1/10 per square foot of area covered, packed and delivered f.o.b. Glasgow, including Windows and Doors. Approximate weight, 1,200 cwts. Iron Staircase extra.

When writing for definite prices, please give, as far as possible, the information asked for on page 66.

Erection of Iron Roofing and Buildings in India estimated for.

TEA FACTORIES—*Continued.*



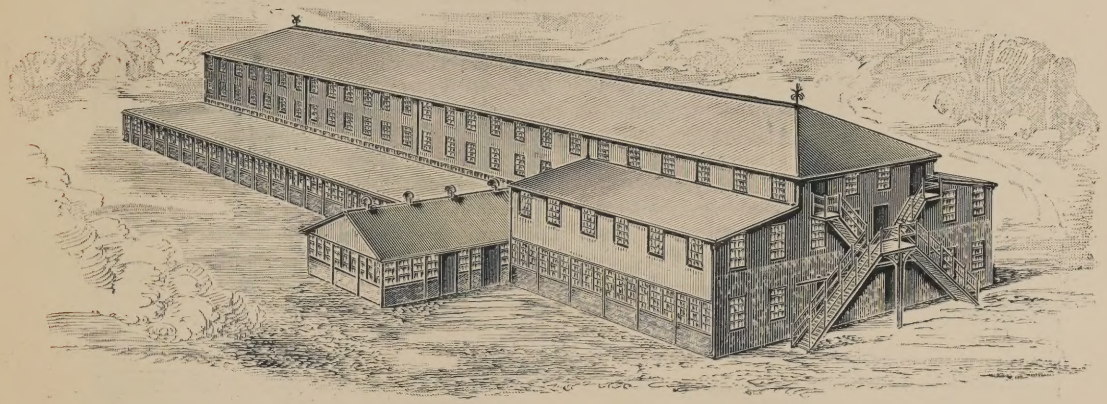
No. 2102.

This design, of which we have supplied recent examples, is a further improvement upon those shewn on the preceding pages, and, to suit growing gardens, usually has one end prepared for future extension.

The Building here shewn covers an area of 14,900 square feet, and consists of Main Building 110 feet long × 50 feet wide × 29 feet high to Eaves, Verandah 20 feet wide along one side and one end, and ditto 40 feet wide along other side (containing firing machinery). A portion of the 20-foot Verandah is also extended, as shewn, to form Engine-house; and increased light is given to the ground floor by the windows just above the junction of side Verandahs to Main Building.

Approximate price, packed and delivered f.o.b. Glasgow, 1/5 per square foot of area covered. Weight about 1,500 cwts.

TEA FACTORIES—*Continued.*



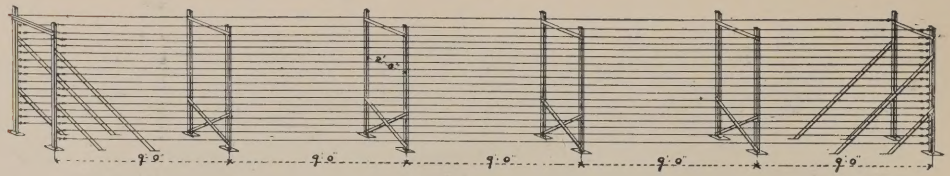
No. 2111.

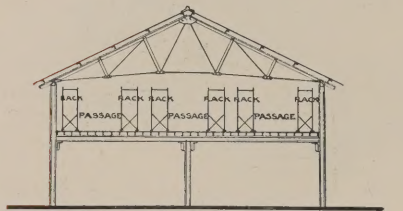
The above represents all the latest improvements in Tea Factory designs, the building being so arranged that every branch of manufacture is kept separate. The two high Verandahs are constructed so as to permit of Fermenting being done on ground floor adjacent to the Rolling Tables, the upper floors being used for Withering; while the Engines and Boilers are contained in separate Building measuring 50 ft. × 33 ft., with ridged Roof as shewn, and are entirely partitioned off from the rest of the Factory.

The Factory throughout is specially well lighted, and outside stairs are provided, giving access to Withering Floors without having to go through manufacturing departments.

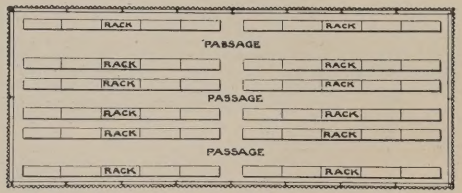
The Building covers an area of 25,470 square feet, the main span being 286 ft. long × 40 ft. wide, the Verandah along each side and one end being 20 ft. wide. Approximate price (without stairs) being 1/7 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 2,970 cwts.

IRON RACKS FOR WITHERING TEA. No. 2480.





CROSS SECTION of Withering Loft 40 feet Wide shewing usual arrangement of Racks



PLAN of Withering Loft 100 feet long x 40 Feet Wide Shewing usual arrangement of Racks

In the furnishing of Tea Factories and Withering Houses these Iron Racks possess many important advantages. From the lightness of materials adopted, it is found that, in a height of 6 feet, 16 tiers of trays can be readily accommodated, against about 12 tiers only when the Racks are made of timber, while a more perfect current of air through the leaf is permitted.

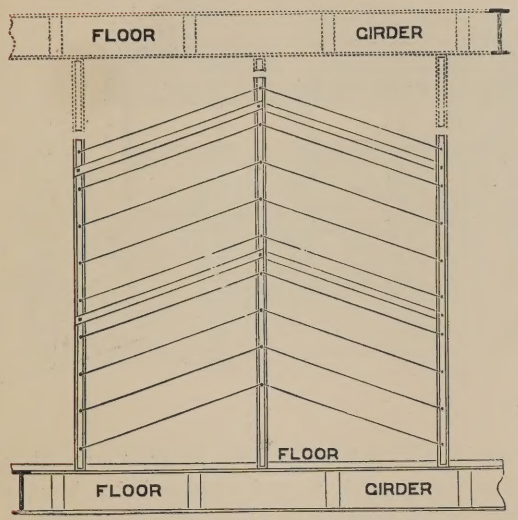
The present prices are indicated by the subjoined specification:—Rack, 45 feet long × 2 feet wide × 6 feet high, for 16 tiers of trays; Standards, 9 feet apart, with Stays at ends as shewn.

	F.O.B. Glasgow.	F.O.B. London.	Ex-Ship Calcutta.
If for fixing to wood floor, ...	£4 12 6 ...	£4 17 6 ...	£5 5 0
If for fixing with concrete in ground, ...	5 10 0 ...	6 0 0 ...	6 12 6

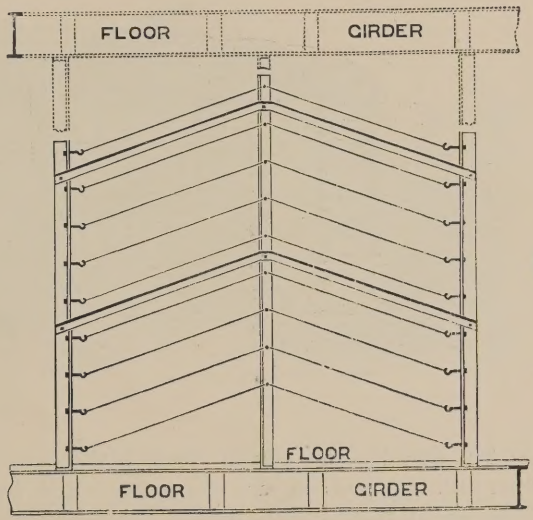
☞ In ordering give Plan, and state whether the *floor* is of *timber* or *concrete*.

IRON RACKS FOR WITHERING TEA—*Continued.*

A



No. 2481.



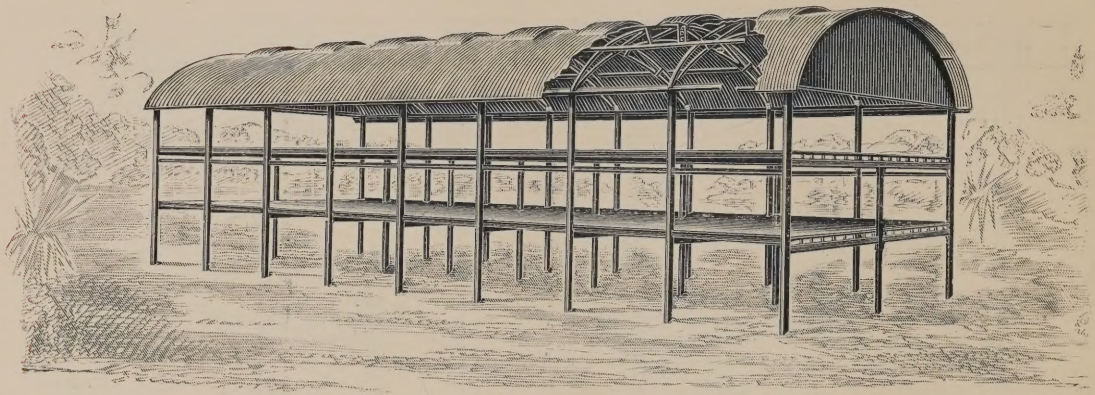
No. 2482.

B

The two styles of Racks here shewn differ materially from those on the preceding page, since, instead of carrying trays, Galvanized Wire Netting is laced direct to the Straining Wires.

In design "A" the Straining Wires pass *through* the Standards, which are of our special "Bulb Flat" Section; while in "B" the Wires pass through light hooks in L. I. Standards, which permit of a side strain being put upon the Wire Netting from time to time, to counteract stretching.

WITHERING HOUSES.



No. 2141.

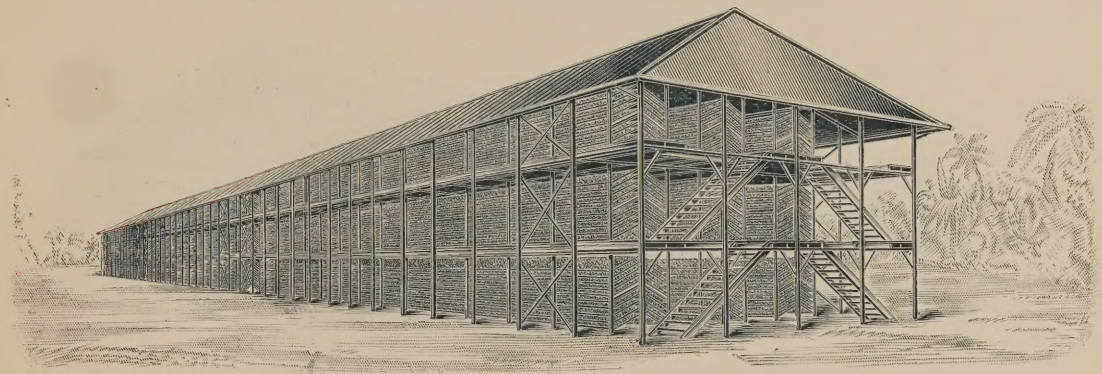
The special feature of this House is the construction of the Roof, which possesses great strength, combined with lightness and ease of erection. Each half-truss is completely riveted together before leaving our works, and all that has to be done on the ground is to bolt the two together in the centre.

As will be observed, very little head-room is taken up by these trusses, so allowing greater freedom in working on the top floor. Thus, with this design of roof equal facilities are got in a building of less height, to one with ordinary trussing, with tie bars almost at eaves level.

Either, or all of these Floors can be fitted with Iron Withering Racks, as shewn on pages 30 and 31.

The Building here shewn is 100 feet long × 36 feet wide × 22 feet high to eaves, and cost approximately 1/3 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 400 cwts.

WITHERING HOUSES—*Continued.*



No. 2152.

This Withering House combines all the most recent improvements that have been made in this class of Building.

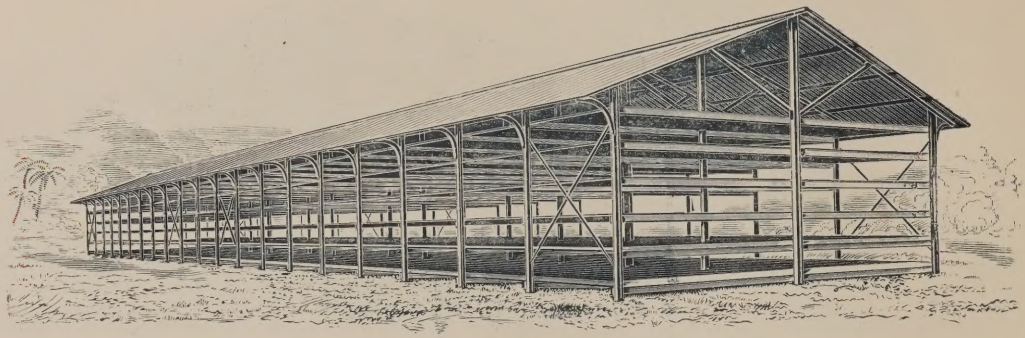
Unlike the previous designs shewn, the Withering Rack Standards here form essential components of the Building; not only carrying the Straining Wires to which the wire netting is attached, but also assisting to carry the Flooring and the Rafters of the Roof.

While strength and rigidity are fully maintained, all the details of construction are of light sections, making the Building simple and easy of erection, and minimizing the cost of transport.

This particular Building is 400 feet long × 36 feet wide × 19 feet high to eaves, and has tiers of Galvanized Wire Netting arranged in Racks, as shewn in our Design No. 2482, Section B, page 31.

In sending enquiries for prices of this Building, please state what Mesh and Gauge of Galvanized Wire Netting is required.

WITHERING HOUSES—*Continued.*



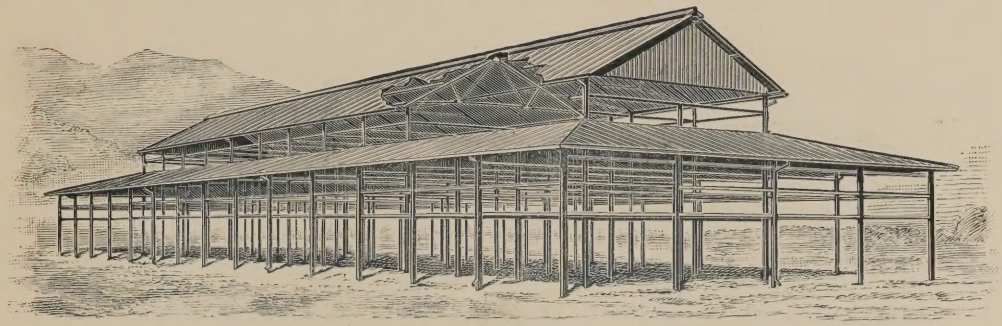
No. 2153.

This is a style of Withering House of which we have also supplied many examples, and has been designed to meet the requirements of those who prefer to wither on "Changs" instead of on Racks.

The Building here shewn is arranged for six "Changs," spaced about 2 feet apart, the upper three being served by Galleries bracketed on Columns on each side of the house (omitted, to avoid confusion in illustration). "Chang" Beams may be of wood or iron, as required.

Approximate price of Withering House as above, 250 feet long × 40 feet wide × 16 feet high to eaves, with steel cross-beams, 1/1 per square foot of area covered. Packed and delivered f.o.b. Glasgow. Approximate weight, 775 cwts.

WITHERING HOUSES—*Continued.*



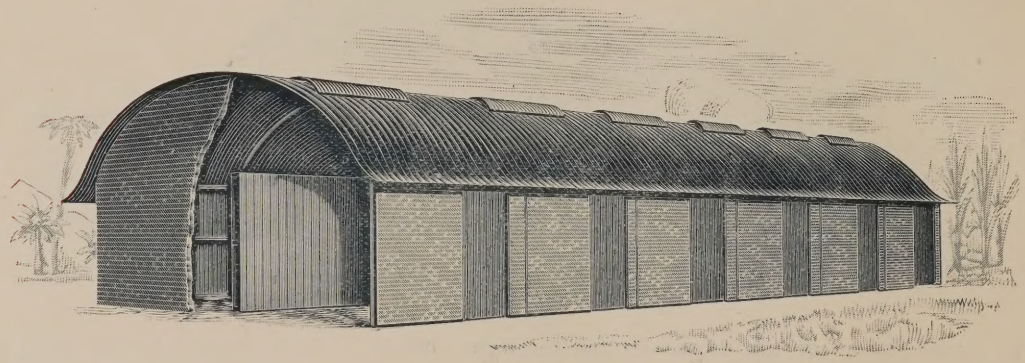
No. 2151.

The special feature of this House is that the floors, instead of being formed in the usual way, consist of bamboo matting covered with hessian, supported on lines of strong wires stretched from end to end of the Building. The great strain resulting from these wires is taken up by the two end bays, the Steel Floor Girders of which are strongly braced together. On the Intermediate Columns preparation was made for purchaser's wood cross-joists, on which the wires were fixed after being strained up.

The main span is 150 feet long × 28 feet wide × 22 feet 6 inches high to eaves, with six tiers of Steel Cross Girders in either end bay. The Verandah, 14 feet wide, runs all round, carrying three floors, as shewn.

The approximate price of this Building is 1/2 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 730 cwts.

COOLIE LINES.

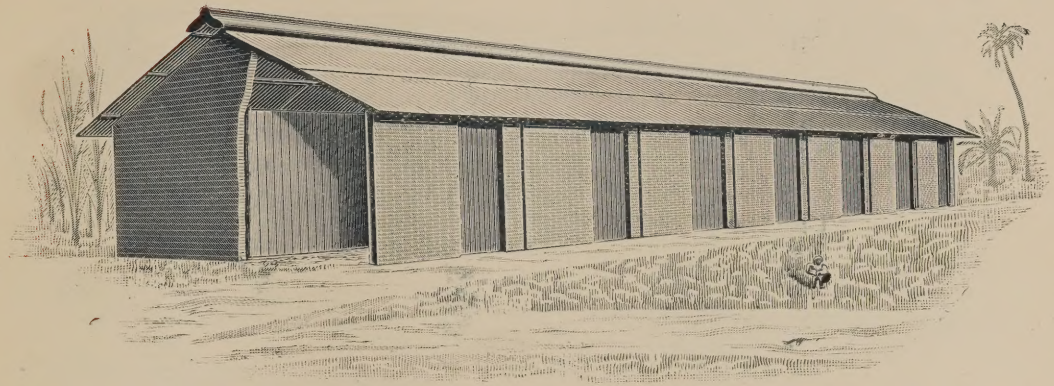


No. 2161.

In submitting these designs for Coolie Lines, we give only those which have been most generally adopted, both on account of their cheapness and suitability. We are, however, prepared to quote for any special designs or arrangements asked, and will always be glad to try and carry out any suggestions offered us.

Approximate price for Coolie Line as above, 100 feet long × 22 feet wide (double line of Houses back to back), carried on Iron Columns, and with Ventilator over each bay, 9½d. per square foot of area covered, packed and delivered f.o.b. Glasgow.

COOLIE LINES—*Continued.*



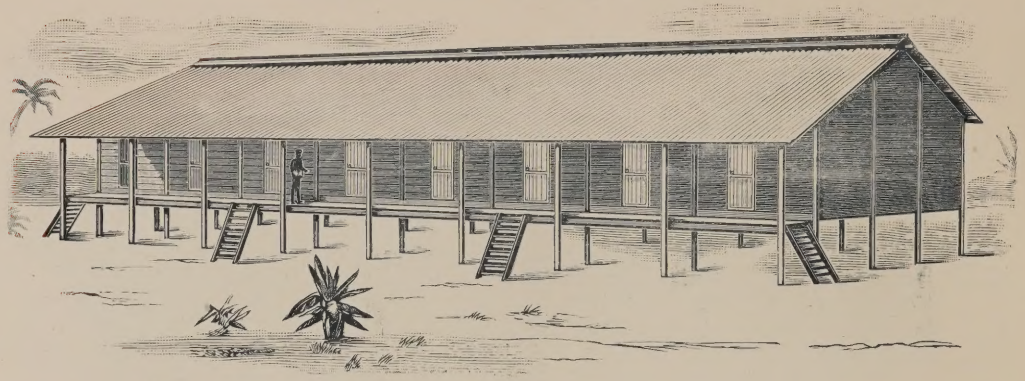
No. 2171.

This design shews a double line of Houses, with Ridged Roof on Iron Columns, and with raised Ridge Cap Ventilator full length.

Approximate price for "Line" as above, 100 feet long × 24 feet wide, 10½d. per square foot of area covered, packed and delivered f.o.b. Glasgow.

Although the first cost of an Iron House is more than that of a "Cutcha" one, it will usually be found that when the annual cost of repairs, risk of fire, &c., are taken into consideration, the "Pucca" Houses come cheaper in the end.

COOLIE LINES—*Continued.*



No. 2172.

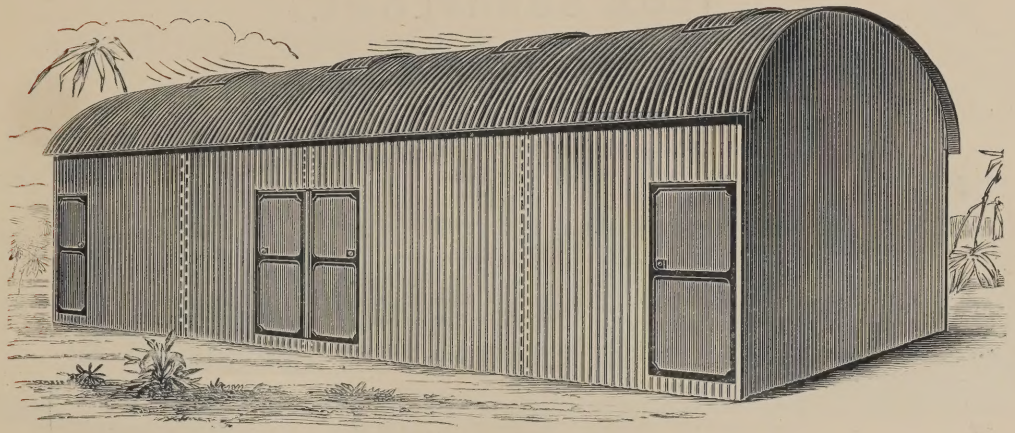
In malarial or swampy districts, where it is not safe for coolies to sleep on the ground, Lines such as shewn above are very useful.

Steel Cross Girders are fixed to the Columns at any desired height from the ground, and on these wood or bamboo flooring is laid; preparation is also made on the Columns to take the wood, or other filling forming the walls; and, as will be seen, a Verandah, 5 feet wide, runs the full length of the front of the building.

The Roof is entirely Iron framed, and covered with Galvanized Corrugated Iron Sheets, as in previous designs, and ventilation is obtained by using a large raised Ridged Capping.

The Building here illustrated is 100 feet long × 35 feet broad × 15 feet high from ground to Eaves, and cost £220, delivered f.o.b. Glasgow; or say, 1/1 per square foot of area covered. Approximate weight, 335 cwts.

COOLIE LINES—*Continued.*



No. 2162.

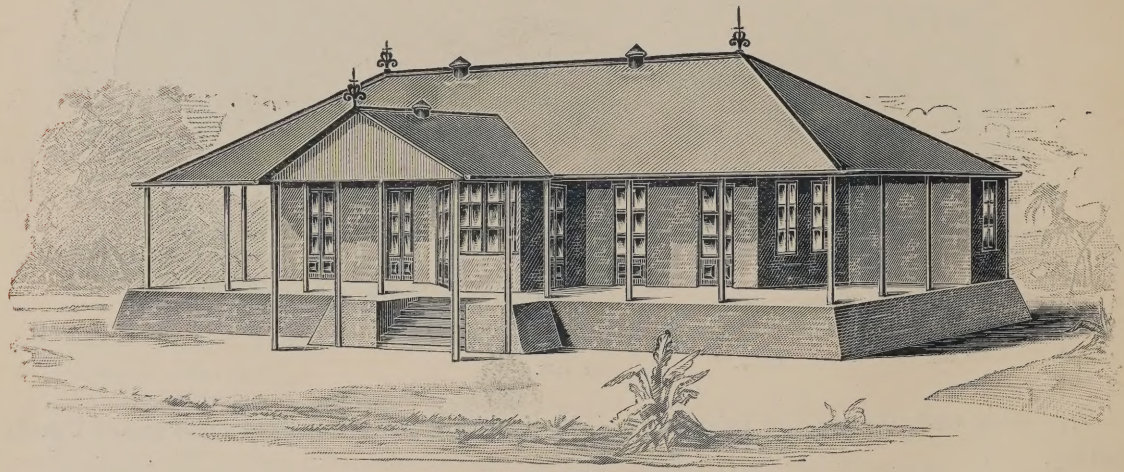
The above block shews a new design of Hut, 100 of which we have recently supplied to the Uganda Railway.

It differs from those previously mentioned in being made entirely of iron, to suit the special requirements of the country, and thus no local material is required to complete the shell of the building.

These Huts are, we understand, to be used either for housing coolies or storing materials; and to facilitate removal as the line progresses, the frame was constructed throughout on very simple lines, most of the parts being interchangeable.

IRON BUNGALOWS.

(Single Storey.)

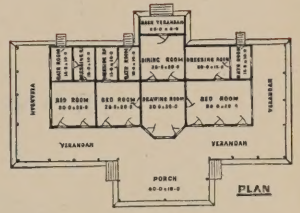


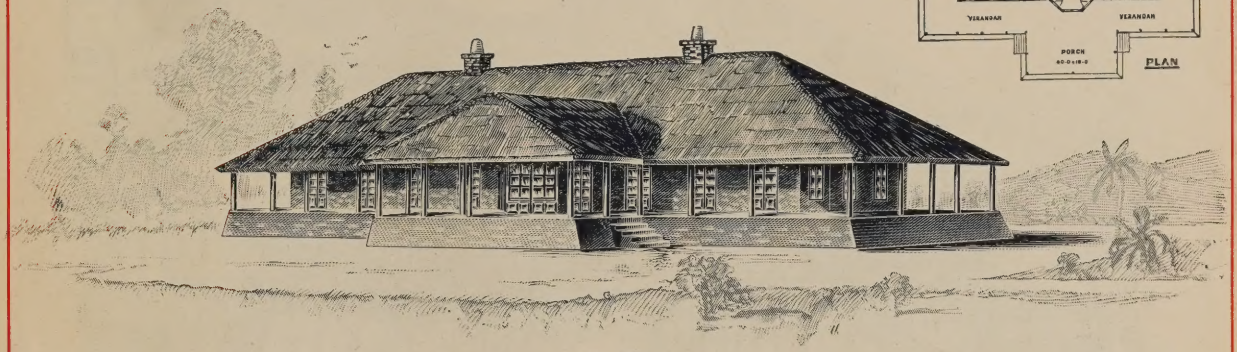
No. 2261.

This is a type of Bungalow specially adapted for Tea Garden Assistants, and can be recommended on account of cheapness, ease of transport and erection. The framework is entirely of iron and steel (the spaces between the Columns being filled in with brick or material of a similar nature), and the Roof is constructed on our Anti-thermal principle, with Ventilators as shewn. For illustration of Building with raised floor, see page 42.

The approximate cost of the ironwork is £245, packed and delivered f.o.b. Glasgow. Approximate weight, 315 cwts.

IRON BUNGALOWS (Single Storey)—*Continued.*



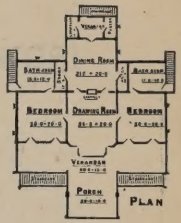


No. 2271.

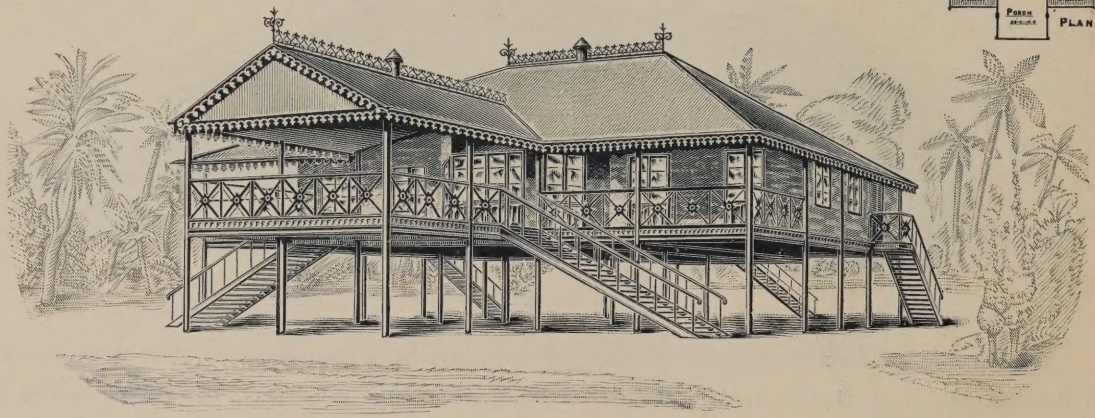
This illustrates a form of Bungalow of which we have supplied several examples. The Roof Covering, in this instance, is of Thatch, fixed on Bamboo Purlins, &c., in the usual way, these being carried by Iron Trusses supported on Steel Columns, round which walls are built. Approximate cost of Iron Framework, packed and delivered f.o.b. Glasgow, £250. Weight, about 410 cwts.

Bungalows of this stamp can be constructed with raised Floor, when desired, as in Design No. 2630, page 42.

IRON "CHANG" BUNGALOWS.



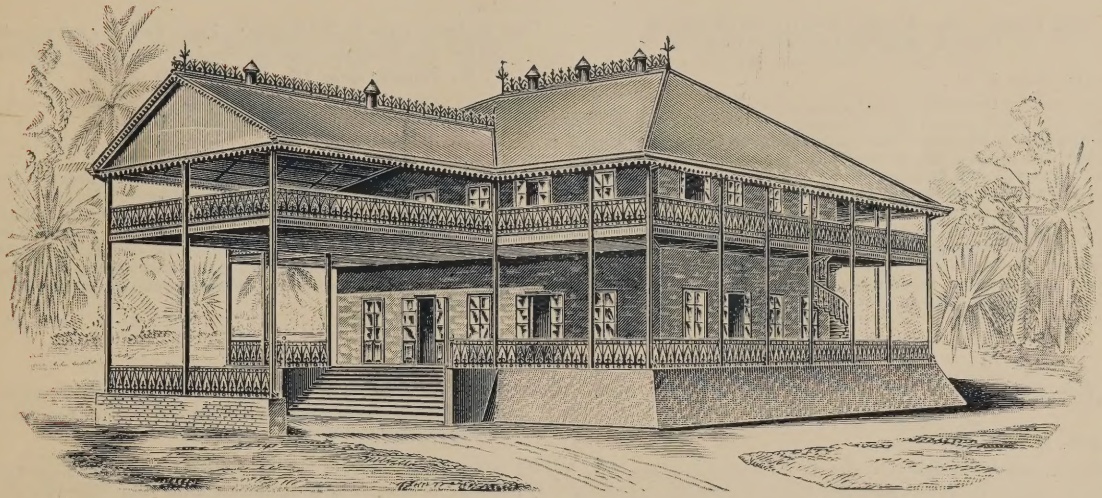
PLAN



No. 2630.

This Bungalow is similar in construction to that on page 40, the only difference being that the Floor is raised some feet above the ground, to suit damp or malarial districts. The Ironwork costs, approximately, £375 f.o.b. Glasgow, and weighs about 480 cwts.

IRON BUNGALOW (Double Storey).



No. 2281.

This block is taken from a photograph of a Bungalow recently supplied and erected complete by us for an Indian prince. The main portion (including a 12-ft. Verandah all round) covers an area of 530 square feet, while the Porch measures about 30 feet square. Ornamental Cast-iron Railing is fitted between the Columns, as shewn.

The cost of such a Building, packed and delivered f.o.b. Glasgow, is, approximately, £850. Approximate weight, 1,100 cwts.

TESTIMONIALS.

Copy of Letter from Messrs. WILLIAMSON, MAGOR & Co., *Calcutta, dated 11th November, 1898.*

Messrs. MAIN & Co.,
Calcutta.

DEAR SIRS,—The large Factory you supplied to the "Heelekah" Division of this Company (Scottish Assam Tea Co., Ltd.) was sent up to replace a building that was destroyed by fire, and had, consequently, to be erected in a comparatively short space of time. There was no difficulty in doing this, as the construction of this building, as is usually the case with the factories you have supplied to different gardens in our Agency, was of a comparatively simple nature; and, when completed, the building provided ample and effective accommodation for manufacture, and has since given satisfaction in every respect.—Yours faithfully,

WILLIAMSON, MAGOR & CO.,
Agents.

Copy of Letter from Messrs. WILLIAMSON, MAGOR & Co., *Calcutta, dated 11th November, 1898.*

Messrs. MAIN & Co.,
Calcutta.

DEAR SIRS,—We have the pleasure to advise you that the different buildings specified overleaf which you have supplied to the Company's gardens during the last two years have given entire satisfaction, being easily erected, and providing ample and well-designed accommodation for the different purposes required.—We are, DEAR SIRS, yours faithfully,

WILLIAMSON, MAGOR & CO.,
Agents for the Moabund Tea Co.

Buildings referred to:—

2 Withering Houses.	3 Iron Bungalows.
1 Railway Station Building.	Iron Coolie Lines.
2 Tea Houses	1 Iron Godown.

Copy of Letter from E. H. HANNAY, Esq., *Empire of India and Ceylon Tea Company, Limited, Borjulie Tea Estate, Borjulie, P. O., Tezpore, dated 21st January, 1899.*

Messrs. A. & J. MAIN & Co., Ltd.,
Calcutta.

DEAR SIRS,—The addition to the Borjulie Factory, necessitated by the fire in October, 1897, is now completed.

The material supplied by Messrs. A. & J. Main & Co., Ltd., is in every way satisfactory, and considering the difficulty of splicing the columns for erecting an extra storey, the whole went together without any hitch. The photograph sent you speaks for itself, and shews the excellent building it now is.—Yours faithfully,

E. H. HANNAY.

Copy of Letter from J. GORDON, Esq., *Superintending Engineer, India General Steam Navigation Company, Limited, dated 20th November, 1898.*

I have much pleasure in testifying to the excellence and superiority of Messrs. A. & J. Main & Co.'s Iron Godowns and Iron Roofing, in connection with all the above buildings, which were supplied by them. The quality of material leaves nothing to be desired, and the fitting together and marking of the various parts was so perfect that their erection was simplicity itself. Everything went up without a hitch, and gave no trouble. The material of every structure is of the best, and I am quite satisfied.—Yours faithfully,

J. GORDON,
Deputy Superintending Engineer.

Buildings referred to:—

Boat Shed.	Smithy and Foundry Roofing.
Machine Shop.	3 Iron Godowns.

TESTIMONIALS—*Continued.*

Copy of Letter from F. G. STEELE, Esq., *Surma Division, Imperial Tea Company, Ltd., dated 13th October, 1898.*

DEAR SIRS,—Tea Factory, 99 feet × 40 feet main span, with 40 feet Verandah one side and 20 feet Verandah the other. Two Lofts.

The new Tea House for Surma Garden has now been erected, and I am very pleased with it. The material is of the best, and the whole of the iron-work fitted together and went up without a hitch, and gave no trouble whatever.

I consider your Tea Factories hard to beat, and am more than satisfied with the one just finished for this garden, and I hope to be able to send you a photo at an early date.—Yours faithfully,

F. G. STEELE.

Copy of Letter from F. G. STEELE, Esq., *Surma Division, Imperial Tea Company, Ltd., dated 13th October, 1898.*

DEAR SIRS,—Iron Bungalow, double storey, 76 feet long × 40 feet wide, with three living rooms, two dressing and two bath rooms on either floor, for Surma Tea Estate.

I have much pleasure in testifying that the new Bungalow supplied by you in 1895 is erected, and has turned out to my entire satisfaction.

You will be pleased to hear that through the very trying time of the "Jubilee" earthquake of last year it stood firm, and not a brick was loosened, or the least damage done to any of the building.

After the experience you can safely say that your iron structures are "Earthquake Proof."

The anti-thermal roofing is a great advantage also.—Yours faithfully,

F. G. STEELE.

Copy of Letter from Messrs. MARSHALL, SONS & Co., Ltd., *Calcutta, dated 12th October, 1898.*

DEAR SIRS,—We have pleasure in stating that the Iron Roof you supplied for our new Godown at 25 Strand Road, Calcutta, in 1894, has given us every satisfaction. The workmanship and materials are of the best, and no difficulty was experienced in the erection, all the parts "coming together" without trouble, a very important factor in work of this nature.—We are, yours faithfully,

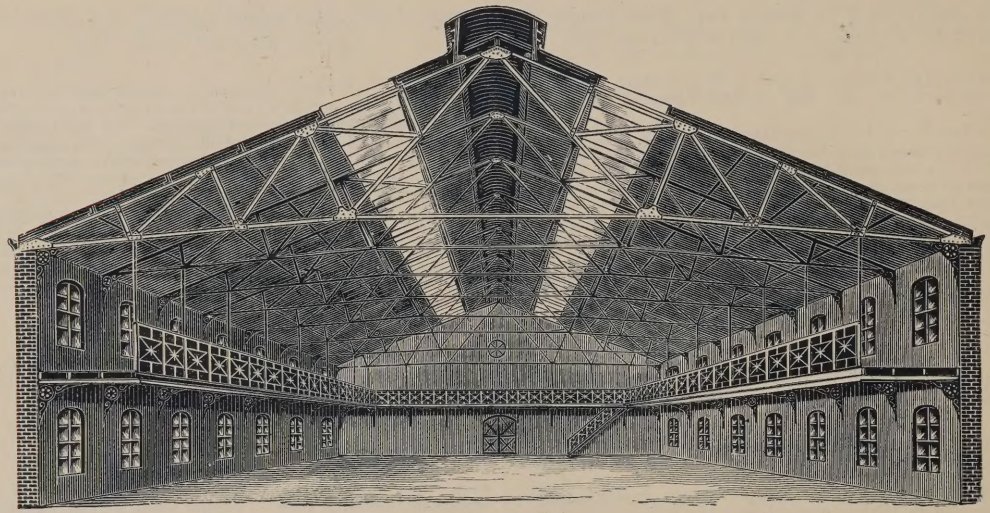
Per pro MARSHALL, SONS & CO., LTD.,
J. HARPER.

Extract from Letter received from MR. LUMSDAINE, *Acting Superintendent of the Tarrapore Tea Company, regarding Engineer we sent to erect a Leaf House supplied by us last year.*

His roofing of the Leaf House is a very fine piece of work; not one leaky spot in the whole house—400 feet long × 34 feet wide. Any orders I asked him to execute he did in a most willing and obliging way. I cannot speak highly enough of him as an Engineer.

The foregoing indicate only a few of the many Testimonials we have received in connection with Buildings supplied by us, but the want of space prohibits us from publishing more.

DRILL HALLS.

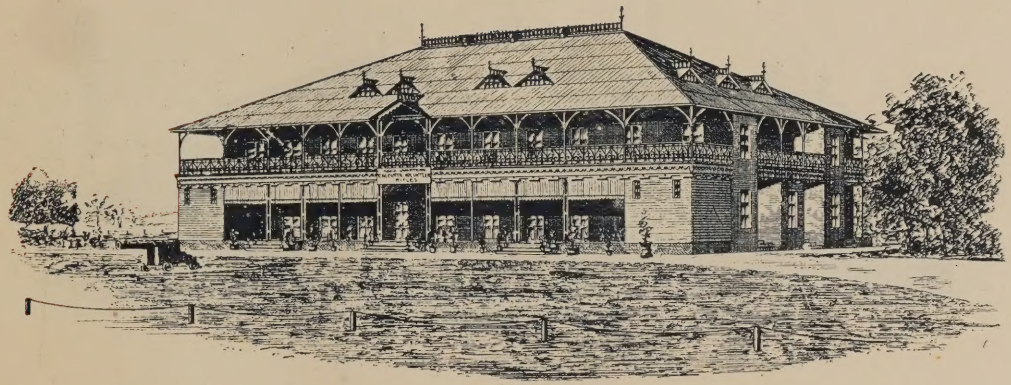


No. 2361.

This design illustrates an effective style of Iron Building suitable for a Drill Hall, Skating Rink, &c. As the Span can be economically made up to about 60 or 70 feet, the Floor is entirely clear of any obstructions, which is a great advantage in such Buildings.

Approximate price for Buildings as above (exclusive of Walls), 105 feet long × 66 feet wide inside, 1/6 per square foot of area covered, packed and delivered f.o.b. Glasgow. Windows and Doors extra.

VOLUNTEER HEADQUARTERS.

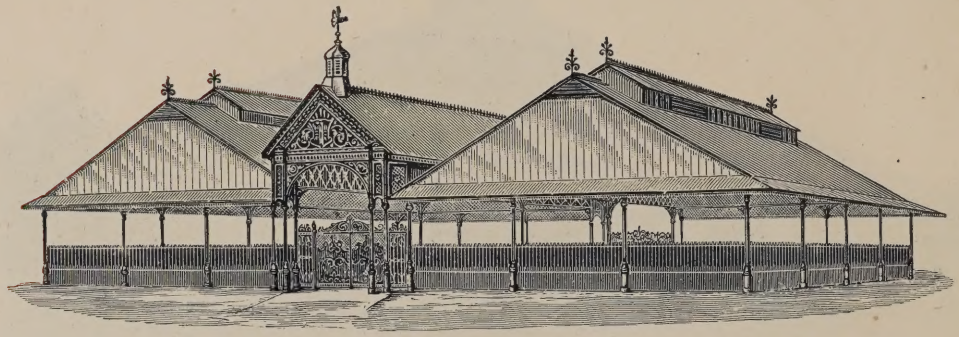


No. 2320.

The above illustration is copied from a photograph of the Building used as the Headquarters of the Calcutta Rifle Volunteers. The complete Iron Framework, including the Anti-thermal Roofing, and extra strong Beams for Upper Floor, was supplied by us, and erected a few years ago.

Designs and Estimates will be made up on receipt of full particulars as to requirements, &c. *See page 66.*

PUBLIC MARKET.

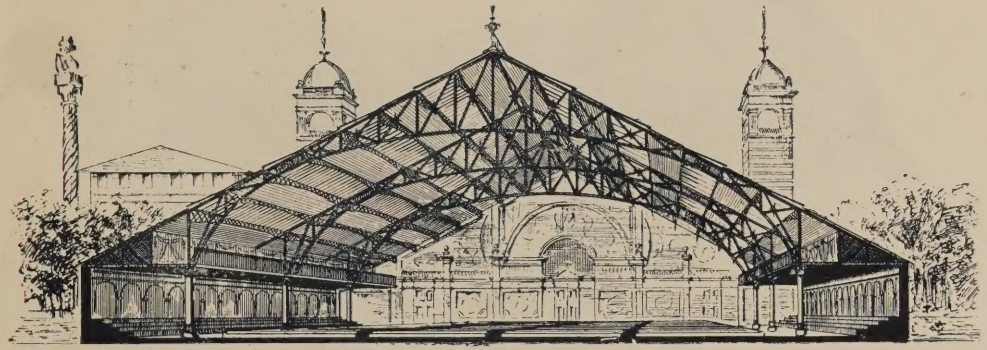


No. 2341.

The above represents one of many Market Places designed by us, and constructed entirely of Iron. The idea in this Building is to have the main passage down the centre, the outer spans being entirely devoted to stalls, &c.; and, with a view to keeping the Floor as clear as possible, the Internal Columns are placed at considerable distances apart, with Ornamental Lattice Girders between to carry the Principals. A Wrought-iron Railing encloses the whole, with large Ornamental Gates, as shewn.

A Building such as this costs about 2/9 per square foot of area covered, packed and delivered f.o.b. Glasgow.

PUBLIC HALL.

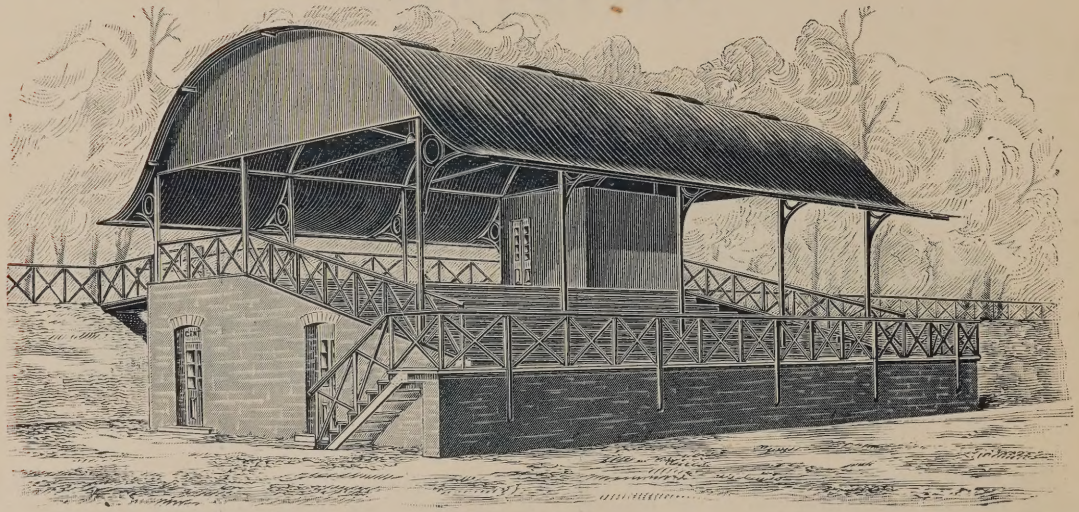


No. 2330.

The above sectional illustration shews a type of Semi-ornamental Roofing very suitable where large clear floor space is of advantage, such as in Public Halls, Markets, Concert Halls, &c. A Balcony is shewn running along each side, with the flooring stepped under same for seats; but this latter space may, of course, be used for Stalls, &c., according to requirements. Ample light and ventilation is provided in the Roof.

See page 66 for particulars as to measurements required.

RACE STAND.

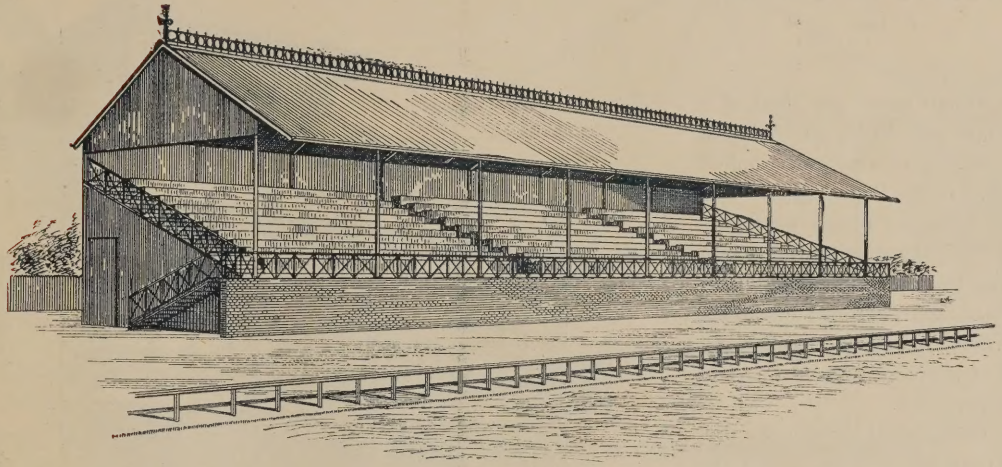


No. 2371.

This illustration is taken from a photograph of a Race Stand supplied by us to Darjeeling. The Framework is entirely of Iron; and as a proof of its stability, we may mention that it passed through the recent earthquake without injury, though many other buildings round about suffered severely. It is constructed to seat 500 people, with Weighing and other Rooms below, and Ladies' Dressing Room, as shewn above.

The dimensions are 50 feet long × 31 feet wide × 21 feet high to Eaves (Eaves overhung 8 feet), and the price of ironwork as shipped by us is approximately £175, equal to 1/6 per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 290 cwts.

RACE STANDS—*Continued.*



No. 2370.

The Stand here shewn is of slightly more ornamental character than the previous one, and is designed to seat a very much larger number of people. In this instance the front of the Building alone is carried on Iron Columns, the back being supported on Brick Walls; the Roof is entirely Iron-framed, however, and Girders are also included for carrying the Seats.

Approximate price of such a Building is 1/10 per square foot of area covered, packed and delivered f.o.b. Glasgow.

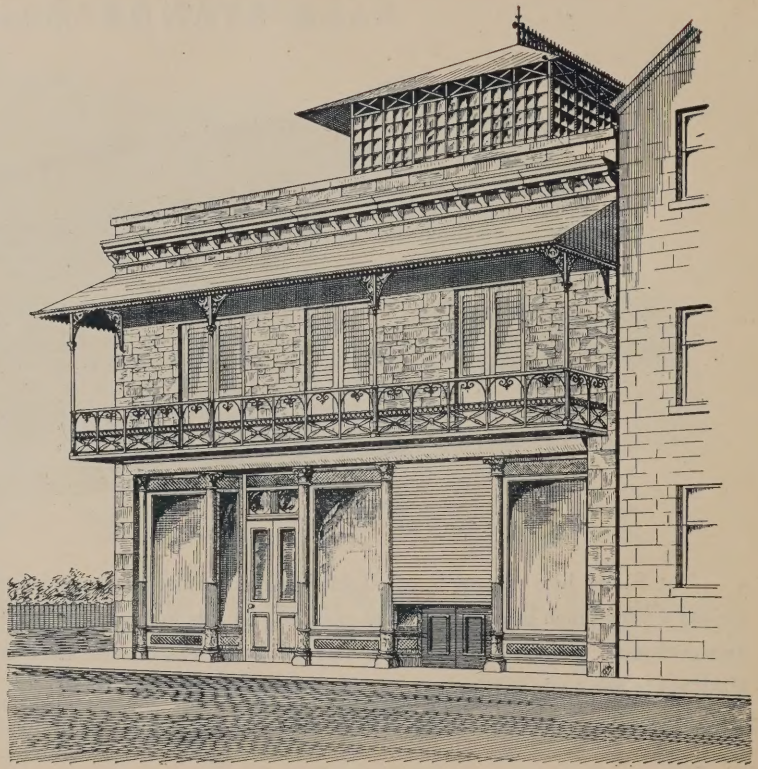
COMPOSITE BUILDINGS.

No. 2290.

This design shews the front of a Warehouse and Store, the complete Ironwork, &c., for which we supplied to a client in the West Indies. The Roof and Gallery Floors were supported on Ornamental Cast-iron Columns, the Steel Flooring Beams being made extra strong; and ample ventilation and light was got by means of a special arrangement of "Lantern" Roof.

An Ornamental Balcony projected over the pavement, and the Warehouse was provided with Patent Revolving Steel Shutters for security when closed.

In the year following the great fire at Trinidad we supplied no less than fifteen Buildings of this type, many covering a very large area of ground.



FIREPROOF WAREHOUSE OR STORES.

This illustration shews a section of Building suitable for Warehouse or Store, fitted with Hydraulic Hoist, as well as Wrought-iron Stairs for giving access to each floor.

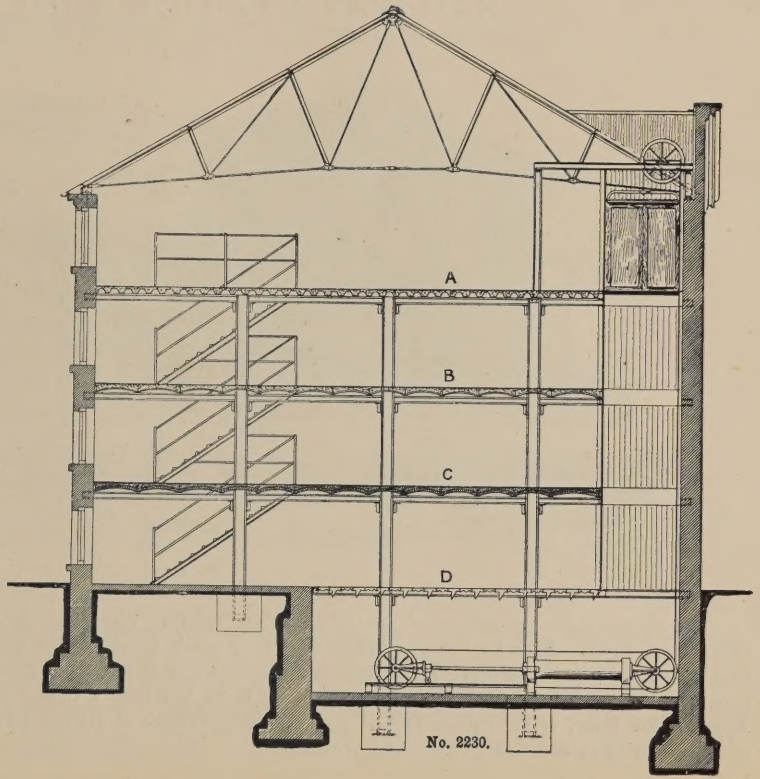
We also shew various arrangements of Flooring, carried on Iron or Steel Beams and Uprights, viz.:

A. Wrought-iron Trough Plating and Concrete.

B. Light longitudinal H Beams, with Curved Corrugated Plating between and concrete on top.

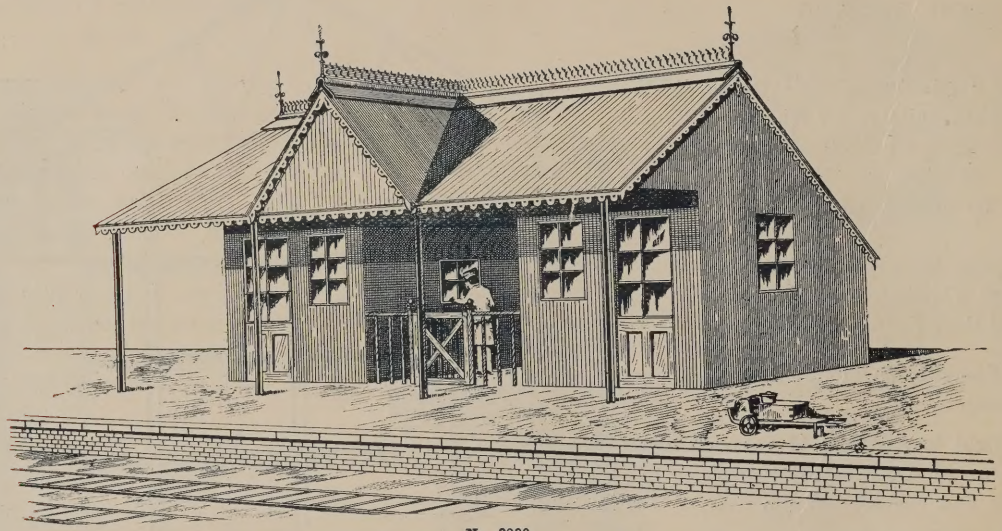
C. Longitudinal H Beams, with Brick Arching between and Concrete on top.

D. Ordinary arrangement of Timber Floor, with Prismatic Lights let in above Hydraulic Engine.



No. 2230.

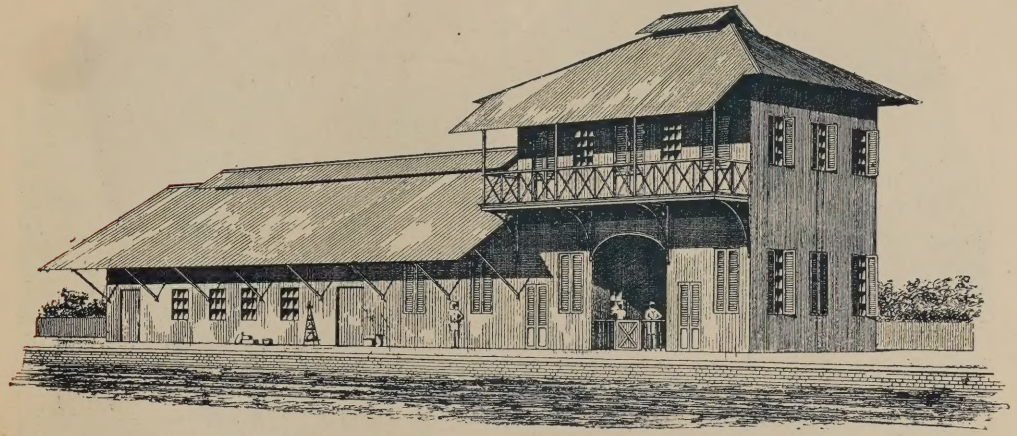
RAILWAY STATION BUILDINGS.



No. 2380.

The above illustrates a form of Wayside Station Building, several of which we supplied and erected for a Railway Company in India. Each Building contained Station Agent's Room, Ticket and Luggage Room, &c., and formed a very simple and compact structure. The Framework was entirely of Steel and Iron, and the Roof of Galvanized Corrugated Iron, arranged anti-thermally. The above Building is 30 feet long × 18 feet wide, with an 8-ft. Verandah along front. Approximate price, 2/ per square foot of area covered, packed and delivered f.o.b. Glasgow. Approximate weight, 100 cwts. (exclusive of Windows, Doors, and Walling).

RAILWAY STATION BUILDINGS—*Continued.*



No. 2390.

This design shews a larger Building than that on opposite page, and one very suitable for more important Stations abroad. It consisted of Luggage and Lamp Rooms, &c, with large overhung Verandah on the single Storey Building, while the higher portion contained Ticket Office and Waiting Rooms on Ground Floor, and Station Agent's House above. The Framework, Roofing, and outer covering of Walls were of Iron, the inside being arranged for Lining with Wood, as a protection against the heat.

RAILWAY STATION PLATFORM ROOFS.

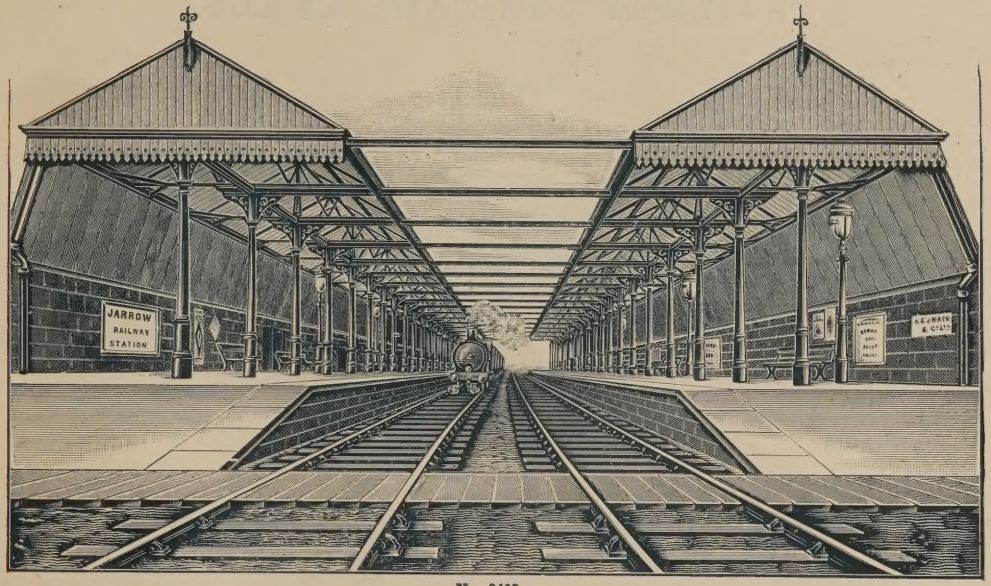
No. 2401.

The above illustration, which is from a photograph, shews part of a large extent of Iron Roofing over Passenger Platforms recently erected by us at New Bridge Street Station, Newcastle-on-Tyne. The different Spans are of the Curved type, with large Ventilator of strong glass along top of each, to afford the necessary lighting and ventilation.

The upper Framework is entirely of Iron or Steel, supported on Ornamental Cast-iron Columns, with Spandrel Brackets to match. The Curved portion of the Roof covering is of Corrugated Galvanized Iron Sheets.

The Roof shewn in foreground is 330 feet long × 27 feet wide × 15 feet high from top of Platform to Eaves, and it costs approximately 2/3 per square foot of area covered. Prices quoted according to requirements.

RAILWAY STATION PLATFORM ROOFS—*Continued.*

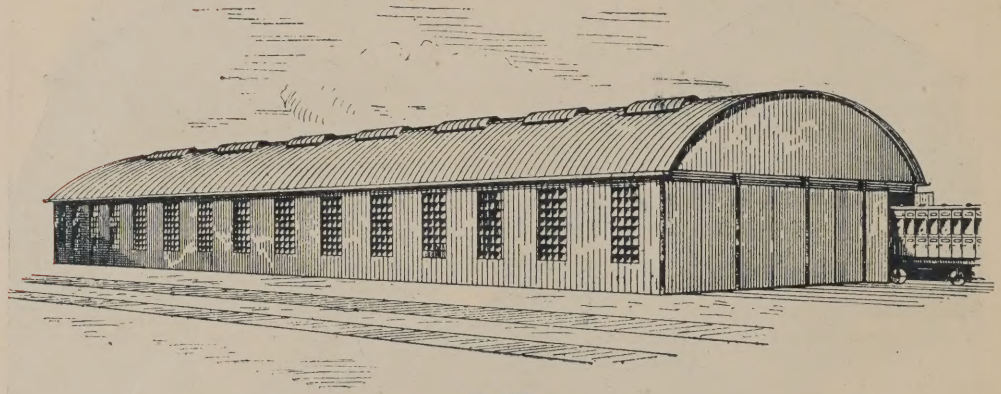


No. 2402.

This illustration is also from a photograph of a Station recently supplied and erected by us for the North-Eastern Railway Company at Jarrow-on-Tyne. Both Roofs are covered entirely with strong glass on iron astragals; the side portions, from top of walls to eaves, being of Galvanized Corrugated Iron. The other details are somewhat similar to the Building shewn on the previous page.

These Roofs cover an area of 8,116 square feet, and cost, approximately, 2/6 per square foot of area covered.

RAILWAY CARRIAGE SHEDS.

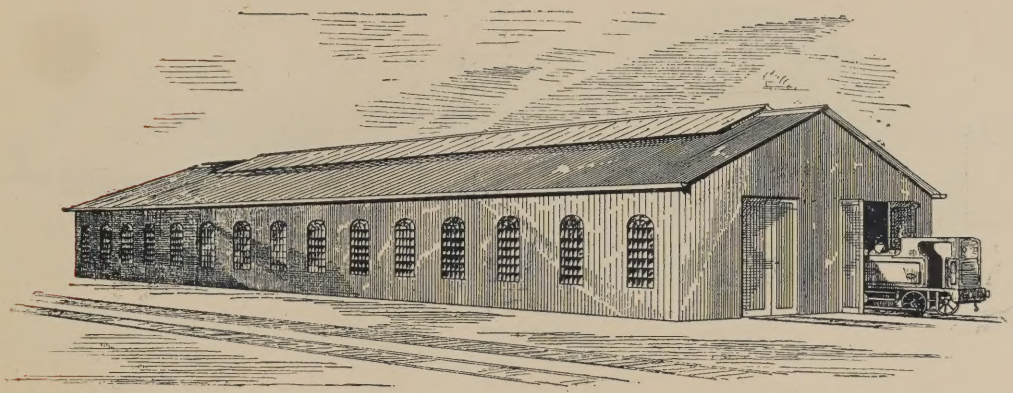


No. 2420.

This design illustrates one of a large number of Iron Carriage Sheds erected by us for the Lancashire and Yorkshire Railway Co., each Shed measuring 50 feet in width, to accommodate four lines of rails. Large Iron Windows were provided in the sides, and special Ventilators were fixed in centre of Roof and at the Eaves.

Approximate price for Building as above, 418 feet long × 50 feet wide × 14 feet high to Eaves, about 1/9 per square foot of area covered, including Doors and Windows.

LOCOMOTIVE SHEDS.

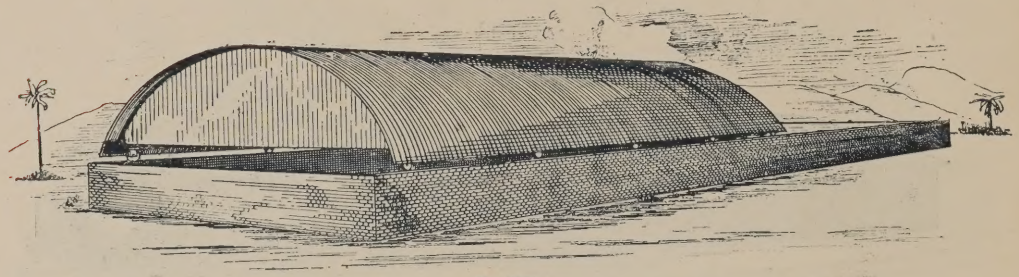


No. 2430.

Above is shewn a somewhat similar type of Building to that on opposite page, but with Ridged Roof and larger Ventilator, made by us for Locomotive Shed for the Great Northern Railway Company of Ireland.

Approximate price for Building as above, 160 feet long × 37 feet wide × 15 feet high to Eaves, about 2/ per square foot of area covered, including Windows and Doors.

MOVABLE ROOFS.



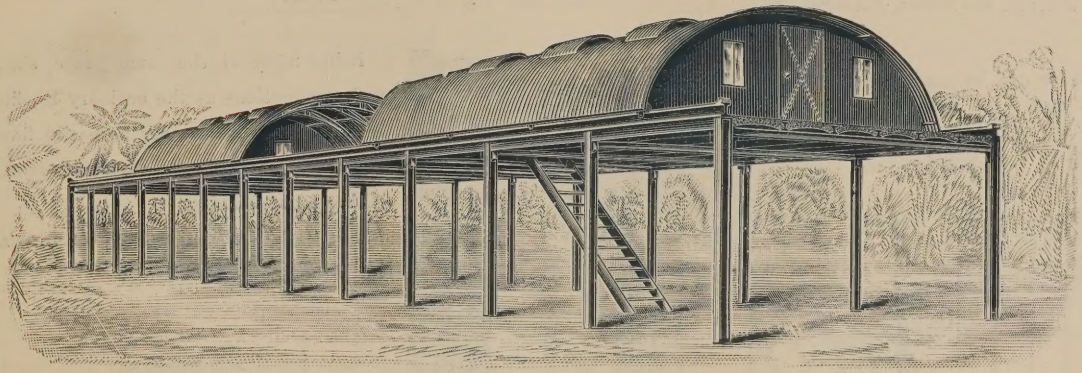
No. 2460.

It is sometimes desirable (as in the case of Silos, Coffee Drying Pits, &c.) that a given space may be rapidly covered or exposed, as required, and the above shews a simple form of Roof such as we have frequently supplied to suit these requirements. The Roof is light, but strongly constructed, and fitted on Wheels running on a double line of Rails.

Where an extra long space has to be covered, the Roof may be made in sections, to telescope or slide within one another, and thus economize space.

The Roof here shewn is 75 feet long × 20 feet wide, and its approximate price per square foot of area covered is 1/, packed and delivered f.o.b. Glasgow. Approximate weight, 120 cwts.

MOVABLE ROOFS—*Continued.*



No. 2461.

This illustration shews the latest improvement in Platform, with Movable Roof for Cocoa or Coffee Drying. With the exception of the Flooring, the structure is entirely of Iron and Steel, the lower portion being intended for a Store, or for Housing Coolies. The Roof may be made in any number of sections, for convenience in handling; and, when desired, the lower portion may be entirely enclosed with Iron.

Two Buildings as illustrated have recently been shipped by us to the West Indies, the Roof being in two sections, and the Columns of lower portion arranged to take local walling.

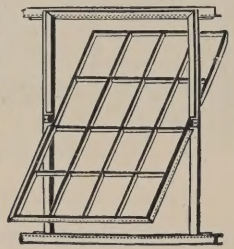
The total length of Platform is 126 feet, while the Roofs measure 63 feet long × 20 feet wide × 7 feet high. Cost of Ironwork as shipped by us was, approximately, £175, delivered f.o.b. Glasgow. Approximate weight, 225 cwts.

PLAIN WROUGHT-IRON WINDOW SASHES,

Suitable for Stores, Factories, &c.

These can be made either "fixed" or "to open" in Timber or Iron Frames, and are equally suitable for building into Brickwork or fixing into Iron Side Cleading.

Fixed Sash.
No. X.

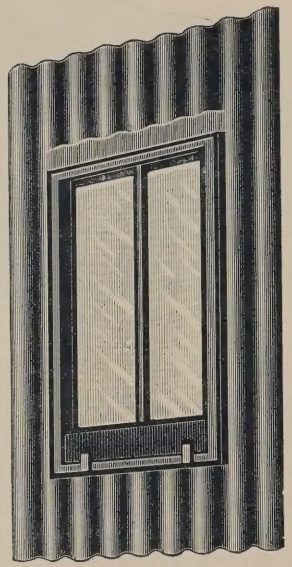


Opening Sash and Iron Frame.
No. Y.

Width, ...	3	4	4	4	feet.
Height, ...	4	4½	5	6	,,
PRICES, ...	13/6	14/6	15/6	16/	each.

Extra to each for Pivoting Arrangement to suit Wood Frame, 3/6.

LIGHTS SUITABLE FOR USE IN ROOFS AND SIDES OF GALVANIZED IRON BUILDINGS.



Being made of the same gauge, sizes, and corrugations as the ordinary Roofing Sheets, these Lights are as easily fixed as an ordinary Sheet, without necessitating extra framing.

The Sashes are made fixed, or to open for Ventilation, as ordered.

PRICES.

In Sheets 6, 7, or 8 ft. long × 22 gauge.

Fixed, each, ... 20/

To Open, each, ... 25/

Dimensions of Light, 36 in. × 20 in

(Glass not included.)

WARRANTED GALVANIZED CORRUGATED ROOFING SHEETS, &c.

SUBSTITUTE FOR SLATES, TILES, THATCH, &c.

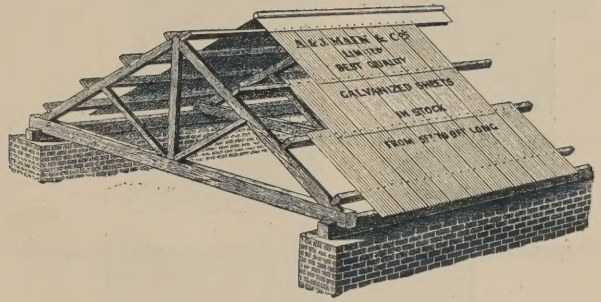
These Sheets are 30 inches wide before Corrugation. After Corrugation, and allowing for overlap at sides, each Sheet covers a width of 2 feet when fixed.

Gauge.	5 ft.	6 ft.	7 ft.	8 ft.	9 ft. long.	Per Superficial Foot.
24	1/9	2/1	2/5	2/10	3/3 each.	2d.
22	2/2	2/7	3/1	3/6	4/1 ,,	2½d.
20	2/7	3/1	3/7	4/1	4/9 ,,	3d.
18	3/3	3/10	4/5	4/11	5/10 ,,	4d.

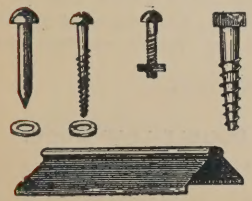
Curved Sheets extra, per ton, 10/.

Cost of materials required to cover any given building, including Sheets, Galvanized Bolts, Screws, Washers, Ridging, and Spouting (if needed), estimated on receipt of dimensions.

NOTE.—Quotations given per ton for delivery at any Railway Station or Seaport on receipt of probable quantity required. Special Railway Rates obtainable for two tons and upwards.

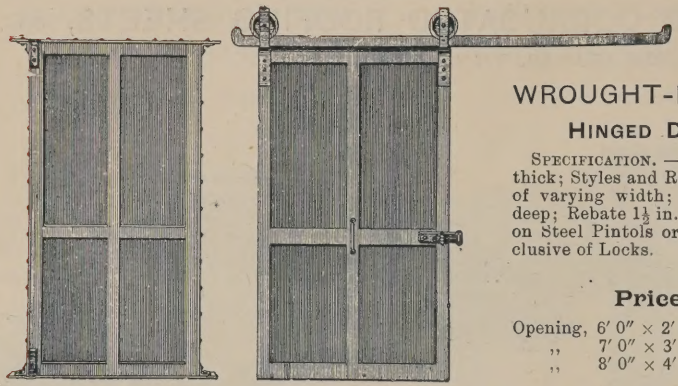


FITTINGS REQUIRED IN ERECTING GALVANIZED SHEETS.



Galvanized Iron Ridge Capping, ...	per foot run,	4d.
,, Screws and Washers, 2½ in., ...	per gross,	3/
,, Coach Screws and Washers, 2½ in., ...	,,	5/6
,, Bolts, Nuts, and Washers, ¾ in., ...	,,	3/
,, Spiked Nails ,, 2½ ,, ...	,,	2/6
Steel Punch, for making Bolt or Screw Holes, ...	each,	1/6

For prices of Rain Water Goods, see page 65.



IRON DOORS.

WROUGHT-IRON DOORS, Hinged and Sliding.

HINGED DOORS.

SPECIFICATION. — Plates ¼ in. thick; Styles and Rails ⅜ in. thick, of varying width; Frames 3 in. deep; Rebate 1½ in. × ½ in.; hung on Steel Pintols or Hinges. Exclusive of Locks.

Prices.

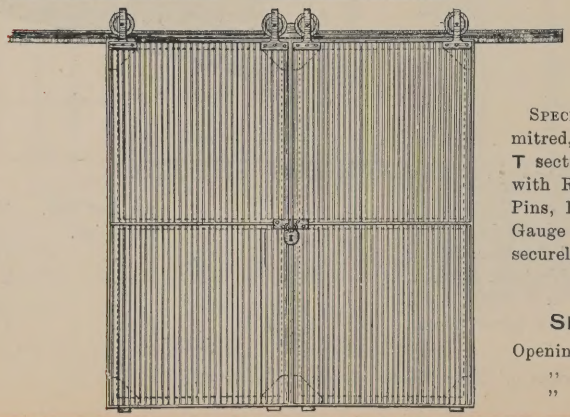
Opening,	6′ 0″ × 2′ 6″,	£4	12	6
,,	7′ 0″ × 3′ 0″,	6	3	6
,,	8′ 0″ × 4′ 0″,	7	15	0

SLIDING DOORS.

SPECIFICATION. — Plates ¼ in. thick; Styles and Rails ⅜ in. thick; Bottom Guide, Channel Runner Bar, Hangers, Cast-iron Bored Wheels with Steel Pins, Handle, Hasp and Staple, &c. Exclusive of Padlock.

Prices.

Opening,	6′ 0″ × 3′ 0″,	£5	5	0
,,	7′ 0″ × 4′ 0″,	6	10	0
,,	8′ 0″ × 5′ 0″,	7	15	0



CORRUGATED GALVANIZED SHEET-IRON SLIDING DOORS.

SPECIFICATION.—Frames of Angle-iron of suitable size, machine-mitred, and with riveted Joint-plates at corners; Centre Cross-bar of T section and Diagonal Flat Bars where required; T Rail Carrier, with Rail riveted on; Hangers, Cast-iron Bored Wheels with Steel Pins, Bottom Guide, Stop, Hasp and Staple, &c. Sheets of No. 20 Gauge Corrugated Galvanized Iron, of best quality, carefully and securely fitted into Frame.

Prices.

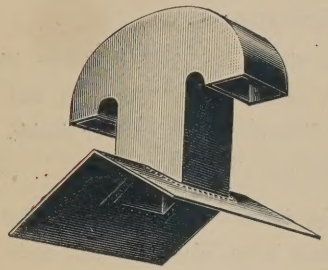
SINGLE-LEAF DOOR.

Opening,	7′ 0″ × 3′ 6″,	£4	5	0
,,	8′ 0″ × 4′ 0″,	4	15	0
,,	8′ 0″ × 5′ 0″,	5	12	0

DOUBLE-LEAF DOOR.

Opening,	8′ 0″ × 8′ 0″,	£9	5	0
,,	12′ 0″ × 10′ 0″,	13	7	6
,,	14′ 0″ × 14′ 0″,	17	15	0

DOUBLE-HORNED VENTILATORS.



These Ventilators can be readily attached to either Curved or Ridged Roofs, and are absolutely weather proof.

They can also be applied to existing buildings with very little alteration.

Prices.

With 18-inch Shaft, ...	40/
,, 12-inch ,, ...	25/
,, 10-inch ,, ...	23/

RAIN WATER GOODS.

O.G. Gutters. Extra Strong Wrought-iron Half-Round Gutters. Valley Gutters.

Cheaper and more Durable than Cast-iron.

ALL GALVANIZED.

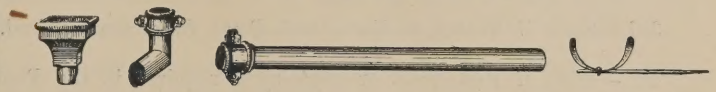
	3½	4	4½	5	6 ins.
Half-Round, in 6-ft. lengths, ...	/10	/11	1/	1/2	1/8 per lin. yd.
Elbows or Angles and Nozzles, ...	1/2	1/4	1/6	1/9	2/ each.
Galvanized "O.G.," in 6-ft. lengths,	1/6	1/11	2/	2/5	2/9 per lin. yd.

Galvanized Valley, in 6-ft. lengths, 18 in. girth, 1/ per foot.

CAST-IRON GUTTERS.

	3½	4	4½	5	6 ins.
Half-Round, in 6-ft. lengths, ...	/8¼	/8¾	/10¾	1/	1/4¼ per lin. yd.
"O.G.," in 6-ft. lengths, ...	/10¾	1/	1/1½	1/4	1/8½ ,,

DOWN PIPES AND CONNECTIONS.



	2½	3	4 ins. diam.
Wrought-iron Pipes, in 6-ft. lengths, Galvanized,	2/3	2/6	3/3 each.
,, Heads, Galvanized, ...	3/3	3/6	4/4 ,,
,, Shoes, ,, ...	1/6	1/9	2/6 ,,
Cast-iron Pipes, in 6-ft. lengths, ...	2/3	2/8	3/10 ,,
,, Heads, ...	1/9	1/11	2/6 ,,
,, Shoes, ...	1/1	1/3	2/ ,,

Gutter Brackets, Black, 3/6 per doz.; Galvanized, 5/ per doz.

Gutter Bolts, 3/ per gross.

DIRECTIONS FOR TRANSMITTING MEASUREMENTS FOR IRON ROOFING.

THE FOLLOWING PARTICULARS SHOULD ALWAYS BE SPECIFIED:—

1st.—The *length, width, and height to Eaves,* and whether on *Iron Columns, Wood Posts, or Walls.* As a general rule, when on Columns or Posts, the length is given as *centres of end Supports,* and the width as *over* same; while if on Walls, state *thickness* of same, and if dimensions are *over* or *inside.* If purchaser proposes to supply Wood Posts and Eaves Beams, give dimensions of same.

2nd.—Unless the Building be in a sheltered position, it is desirable, for the safety of the structure, that the ends be closed in at least down to Eaves level. When Building is on Walls, state if ends will be built *up to,* or *past* Roof Sheets, or if *Iron Cleading down to Eaves* is required.

If on Columns or Posts, state if Building is to be *partly* or *wholly* clad with Iron Sheets below Eaves level; in the latter case stating what *Windows* and *Doors* are required, and dimensions of same.

3rd.—State if *Gutters* at Eaves and *Down Pipes* are required.

4th.—State if *Ventilation* or *Lighting* is required in the Roof, and, if possible, give idea of amount required.

For further notes on this, see page 7.

5th.—Refer to the design in this Catalogue which most nearly embodies the desired arrangements, and generally give full particulars of the Roof or Building desired, with any supplementary information likely to be of service to us in designing a satisfactory and economical structure.

BRIDGE SECTION.

On the following pages are shewn a few of the many different types of Bridges, &c., which we have from time to time designed and manufactured for clients in all parts of the world. No attempt is made to give prices for the different structures shewn, as these vary so much with any alteration in the dimensions or loads required to be supported.

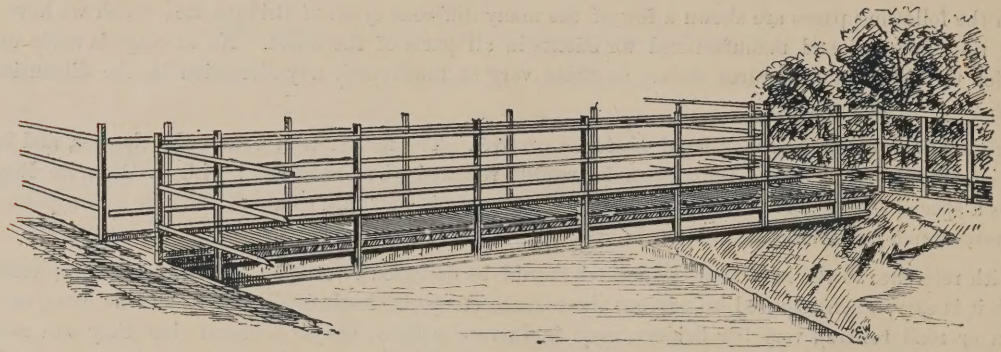
The Roadway of Bridges may be of *timber* or *concrete*. The former is of course the cheaper, and is very suitable for light traffic, as the timber can be readily renewed when necessary; while a Concrete Roadway requires a special arrangement of Beams and Plating to carry it, and this, combined with its own great weight, necessitates much heavier Main Girders.

With reference to the load these structures should be designed to carry, a word of warning is necessary. Though it is easy, when required, to prevent the passage of special loads (such as heavy laden carts, or steam traction or road rollers), very few Bridges, even in private policies, are so situated that they can *never* be covered by a crowd of people; thus even the lightest type of Bridge should be of such strength that it will not be dangerously strained should a crowd occasionally collect on it, while the more exposed Bridges must be designed for frequent loadings of this nature, besides such special loads as passing traction engines, &c.

Unless some special style of Bridge be desired, the particular type should be left for us to determine, as our large experience will enable us to quote for the most suitable and economical form to meet the special requirements of the case.

As each enquiry necessitates the making up of a special design and calculations (the latter in most cases being checked by means of **Stress Diagrams**), a reasonable time must be allowed for this; and we cannot undertake to quote for Bridges unless the most careful information is sent us. *See page 72 for particulars required.*

ROLLED GIRDER ROAD BRIDGES.



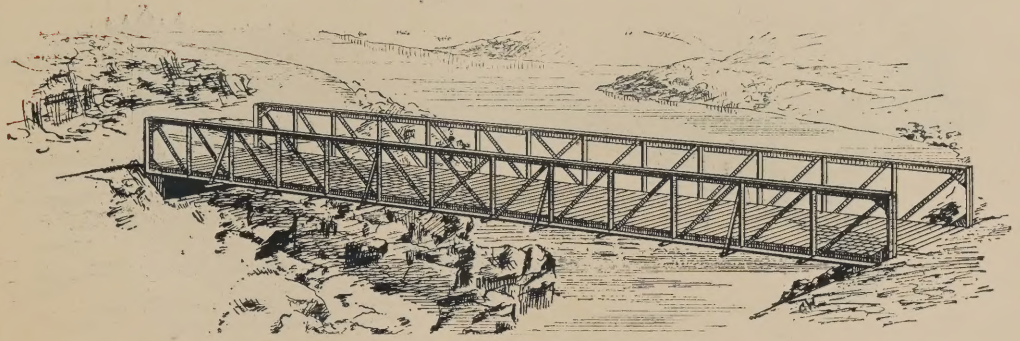
No. 2500.

This design shews a very simple type of Bridge, suitable, with ordinary traffic, for Spans up to about 30 feet. It consists of a series of H Section Beams of suitable strength, properly tied together, on which the Flooring rests. A simple form of Iron Handrail is shewn on either side of the Bridge.

By the addition of special bracing underneath the Girders, the Bridge may often be economically made up to about 45 feet.

Where the total width is considerable, and Piers can be cheaply built, this type of Bridge may be applied in a series of Spans.

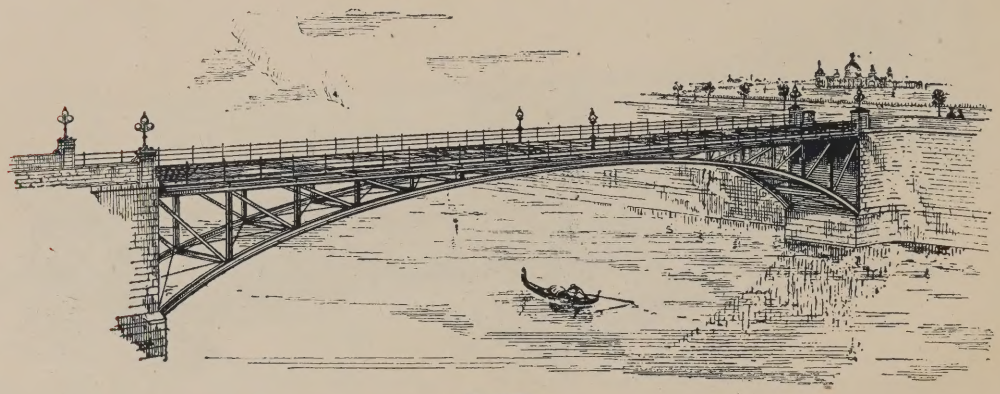
FOOT OR BRIDLE-PATH BRIDGES.



No. 2520.

For light loads, and where the Span exceeds the economical limit for the Rolled Girder type of Bridge, the simple form of Lattice Girder shewn above is very suitable. As illustrated, the side Girders also form the Handrail, and this, with the Timber roadway shewn, combines to make this type very economical, and well suited for estate purposes, where light and restricted traffic only has to be provided for.

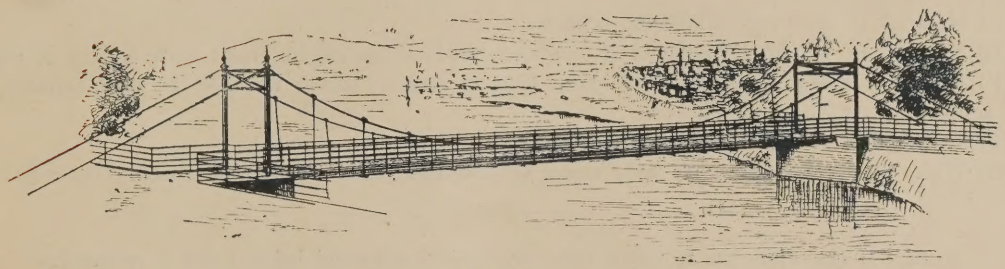
ARCHED GIRDER BRIDGES.



No. 2560.

The above design illustrates an Arched Bridge of light and elegant appearance. This type requires very strong and substantial abutments, and where these can be cheaply built it will form an economical Bridge, and is particularly to be recommended where appearance is an object. It may be economically made in Spans up to about 300 feet.

WIRE ROPE SUSPENSION BRIDGES.



No. 2570.

This illustrates one of the simplest forms of a Wire Rope Suspension Bridge, suitable only for light foot traffic.

As the strains on the *back ropes* are very considerable in this type of Bridge, great care must be taken that the anchorage for these are properly made; where this can be cheaply done, the above type of Bridge will be found very economical for spanning reasonable openings.

DIRECTIONS FOR TRANSMITTING MEASUREMENTS FOR BRIDGES, &c.

THE FOLLOWING PARTICULARS SHOULD ALWAYS BE SPECIFIED:—

(A) Span or length, face to face of abutments.
(B) Width of Roadway.
(C) Material of Roadway—timber or concrete.
(D) Nature and weight of traffic to be accommodated: if for engine traffic state weight of engine.
(E) Height of Bridge Roadway above flood level of stream; this is to allow the most suitable design to be adopted.
(F) In the case of opening spans, the clear width of opening required.
(G) When *intermediate piers* for wide rivers are required, state whether of masonry or iron.

NOTE.—If the Piers are to be of Iron, the following special information is required:—

1st.—Height of Bridge Roadway above *bed of river.*
2nd.—Depth of water at high flood.
3rd.—Nature of the bed of river, and the depth to which Piles may be screwed.

☞ Unless the bed of the river is free from rock and large stones, Screw Piles are unsuitable.

Plans and Specifications prepared by Engineers estimated for and carefully executed; and when necessary for the satisfaction of Engineers, stress diagrams of designs, prepared by ourselves, will be furnished; but in all cases, diagrams, designs, specifications, and all other information supplied by us, are exclusively *private and confidential.*

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IRON AND STEEL BUILDINGS.

A. & J. MAIN & CO., Limited,

Structural Engineers,

CLYDESDALE IRON WORKS, POSSILPARK, GLASGOW.

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11 Leinster Street, DUBLIN.
31 Dalhousie Square, South, CALCUTTA.

54 Gordon Street, GLASGOW.
Corn Exchange Buildings, EDINBURGH.

IRON AND STEEL BRIDGES.